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The Water Supply of some Great Cities.

THE pure inland seas and mighty rivers of North America afford to the inhabitants of that quarter of the world an unstinted supply of water, for all purposes of navigation, cultivation, mechanical power, and domestic use. The Mississippi River alone drains an area of more than ten times the extent of the United Kingdom. The surface of the water of Lake Superior, at a level of 628 ft. above the sea, covers an area larger than that of the whole of Scotland. The length of the inland navigation, from the Straits of Belle Isle to Fond-du-Lac, at the head of Lake Superior, is 2,384 statute miles, and from the same point of starting to Chicago, on Lake Michigan, almost exactly the same distance; while the ocean navigation from Belle Isle to Liverpool measures only 2,234 statute miles. The Ohio River, from which the great city of Cincinnati derives its water supply, has a mean annual flow of 150,000 cubic feet per second, and is 4,000 ft. wide when it falls into the Mississippi, nearly 1,100 miles above the mouth of the latter river. Lake Michigan, on the borders of which has risen the most rapidly-developed of all the great cities of the New World, namely, Chicago, has an area of 23,000 square miles. It is 320 miles long, 100 miles broad, 628 ft. above the level of the sea, and is said to be 100 ft. deep. The Croton River, at a distance of 33 miles above New York, is raised by a dam to a height of 166 ft. above mean-tide level at that city, and its waters, led thence in an aqueduct, flow at a level which provides for the supply of 90 per cent. of the area of that city by gravitation. Thus, whether we regard abundance and purity of water, or natural facilities for its distribution by gravitation, every imaginable form of convenience to the dweller in cities for the supply of his need of this great necessary of life is offered by nature in the United States. Nor is there any part of the surface of the globe in which the skill and perseverance of man have been more efficient in making the best of the gifts of nature.

It is thus of no small interest to the residents of older and more densely-populated countries, especially in those localities where the rapid increase of population has attained such a density that the citizens could not be supplied with enough water from the skies above them, even if every drop that fell over the districts in question could be caught and stored for use, to ask what the genius of the American engineer has done to supply the need of the urban population of the chief great cities of that continent from the inexhaustible stores of its lakes, rivers, and running and falling waters.

In the United States exist (or existed at the date of the last census) but ten cities of each of which the population exceeds 200,000 souls. In the United Kingdom, excluding the metropolis, there were also, at the date of the last census, only ten cities of each of which the population exceeded 200,000 souls. On the Continent of Europe twenty-four capitals and great seaport towns exceed that population; but neither are the data so well ascertained, nor the conditions so distinctly characteristic, as is the case with the cities of the United States. The 3½ million residents of our ten great centres of population, and chiefly those of the metropolis, who form a yet larger body of water consumers, may well look with interest to the outcome of the experience of 5 millions of townsfolk (in 1880, 4,855,000), of kindred race, placed amid the unfailing waters of North America.

Of these great cities, three, viz., New York, Brooklyn, and San Francisco, have laid out in the aggregate about the same sum that has been expended in the London waterworks, in order to obtain the advantage of a supply by gravitation, for an aggregate population little more than half that of London. Boston also depends on gravitation, drawing its supplies from the Sudbury river, and the Lakes Cochituate and Mystic. Philadelphia pumps to reservoirs, from the Schuykill and the Delaware rivers. Baltimore depends partly on gravitation and partly on pumping, taking its supplies from Jones's Falls and Gunpowder Rivers. St. Louis and New Orleans pump to reservoirs from the Mississippi, as does Cincinnati from the Ohio. And Chicago, as original in its mode of procuring water as in so many other features of its masterly engineering, draws its supply from the pure water of Lake Michigan, through a tunnel of two miles in length under the bed of the lake, fed through a down-pipe at the end in a depth of 32 ft. of water. Alone among these great Western cities, Chicago (owing to its low level) adopts the old-fashioned English mode of pumping to a stand-pipe. Of all the ten cities, the cost at Chicago is the lowest, whether as regards outlay of capital in proportion to the number of inhabitants, or working cost per million of gallons. On the other hand, so freely is the water dispensed in Chicago, that the daily delivery averages 109 gallons per inhabitant. It is of interest to take note of the growth of the city which, so far as present information goes, has at once the cheapest and the most copious water-supply in the world, although, owing to the liberality with which it is dispensed, the annual cost per inhabitant is higher than that in either New York or Philadelphia.

The population of Chicago, which, in 1830 was seventy persons, became in

1840	4,583
1850	29,963
1860	112,170
1870	295,977
1880	503,185

Language fails to add to the force of these figures. From 1870 to 1880 the increase has been nearly sixty souls per day.

The waterworks of Chicago, as they existed at the date of Sir Charles A. Hartley's visit in 1873, were described by that engineer in a paper communicated to the Institution of Civil Engineers in the following year. It was found, Sir Charles says, by careful borings, that a bed of compact blue clay, at least 100 ft. thick, underlay the thin crust of silt and sand which formed the bottom of the lake. On this bottom, at the distance, as before said, of two miles from the shore, was formed an artificial island to serve as the locality for a shaft at the lakeward end of the tunnel. For this purpose a crib or timber frame, of a pentagonal plan, 90 ft. in diameter, 40 ft. high, and with walls 25 ft. thick, was constructed on shore, towed to the selected spot, and filled, in fifteen prepared compartments, with 6,000 cubic yards of stone to sink it to the bottom of the lake. The top of this structure, when settled into place, stood 5 ft. above the water, and in the centre of the mass was a sort of open well, of about 30 ft. in diameter. Within this framework, which contained 50,000 cubic feet of whole 12-in. timbers, a column of seven cast-iron pipes, of 9 ft. in diameter, and of a total length of 63 ft., was sunk through the clay to 31 ft. below the bottom of the lake. The clay was excavated within as the pipe sank, and the tunnel was started from below to meet that previously commenced from the shore. This gallery is nearly circular in section, being 5 ft. 2 in. in depth, and 5 ft. in width, and consists of two rings of brick in cement, 8 in. thick. It was started from each end, the lake end being commenced eighteen months later than the work from the shore. The land shaft is sunk to 70 ft. below the level of the lake, and 77 ft. below that of the ground, so that the tunnel has a landward fall of 7 ft. in the whole distance. The two excavations met at about one quarter of the distance from the crib to the shore.

Four steam-pumping engines were provided for the service of the city, but at the commencement of 1873 a new double-beam engine was started as a relief. This, which is said to

be the largest pumping-engine in the United States, has two 70-inch steam cylinders with 10-ft. stroke, and works two pumps of 57 in. diameter, delivering 36 millions of gallons of water in twenty-four hours. If worked together with the other engines there is a combined capacity of 75,000,000 gallons per twenty-four hours. A standpipe, 140 ft. above the level of the lake, is protected by a stone tower 170 ft. high. The pumps are considered to force the water to a height of 132 ft., but in the daytime the delivery is said not to rise higher than the second story of the houses. The water is supplied through thirty-eight miles of mains, the largest of which have a diameter of thirty-six inches.

The power of delivering a daily supply of water equal to half of that now demanded by the wants of 4,000,000 of Londoners was not, however, enough to slake the thirst of Chicago. A second intake-shaft and tunnel were in progress at the time of Sir Charles Hartley's visit in 1873, and a land tunnel, 7 ft. in diameter, was pierced for four miles westward of the lake, in order to supply a second set of pumping works to accommodate the extension of the city. By the year 1880, as we learn from Mr. J. J. R. Croes, the author of "Statistical Tables of the Water Works of the United States," the sum of 1,868,000*l.* had been expended on the water-works of Chicago, the annual revenue from water rentals amounted to 206,000*l.*, and a mean quantity of 109½ gallons per head of the population was daily supplied.

With this enormous volume of water, and with the simplicity of arrangement which the unlimited supply and the low level of delivery render possible, it is not matter of wonder that the working cost of water delivery in Chicago is by far the lowest in the world. In the nine years ending in 1872 the cost of delivering a million gallons of water varied from 52s. to 32s. In 1882 it had fallen to 22s. But the revenue of the works amounted, in the last-named year, to 10·26*l.* per million gallons, and the cost per inhabitant, owing to the copious nature of the supply, was 26 per cent. higher than that incurred in the same year by the inhabitants of London.

While Chicago is thus the cheapest of the great cities of the West in the procurement, if not in the sale, of water, the lowest cost per inhabitant occurs in New York. We must, indeed, make exception in favour of San Francisco; but the figures stated with regard to the latter city are in some respects so anomalous that we await the result of inquiries made in the United States on the subject before quoting them to our readers. Of nine of the ten cities, certainly, New York is at the same time the cheapest, and the only one that supplies water at a less rate per inhabitant than the average price in London. Yet the capital laid out on the New York waterworks is 5·84*l.* per inhabitant, while that in Chicago is only 3·73*l.* per inhabitant, and the working cost per million gallons is nearly twice as much in New York as in Chicago, while the revenue is only about 3 per cent. more.

The water supply of New York is provided by the construction of a dam across the valley drained by the Croton River, about six miles from its mouth, which raises the water to a height of 40 ft. above the original level at that point; or to 166 ft. above the mean tide level at New York. From this dam to the Harlem River, which is crossed by an aqueduct containing eight arches each of 80 ft. span, and seven arches each of 50 ft. span, runs an uninterrupted conduit of stone and brick masonry, set in hydraulic cement, of thirty-three miles in length, including a tunnel through rock. The Harlem Aqueduct was built to carry two cast-iron pipes, each 4 ft. in diameter, at the level of 108 feet above mean tide; but a 7½ ft. diameter pipe of boiler plate was laid down in their place. The masonry conduit is continued for two miles from the Harlem Bridge. Then the Manhattan Valley is crossed by syphon pipes, and two miles more of conduit and aqueduct brings the water to the receiving reservoir at New York. This reservoir, formed in two divisions, has an area of 31 acres, and a capacity of 150 millions of imperial gallons. It is connected with a distributing reservoir of an area of 4 acres, a depth of 36 ft., and a capacity of 20 millions of imperial gallons; an additional receiving reservoir of an area of 106 acres, and a capacity of 1,000 million gallons; and a new storage reservoir in the Croton Valley, of three times the last-named capacity, raises the combined capacity of the whole of above indicated reservoirs to 4,570,000,000 gallons. And yet another reservoir in the Croton Valley was in course of preparation, at the time referred to, with a capacity of 3,700,000,000 gallons; the object being, in case of the occurrence of long droughts, to provide for 82 days' consumption of the city, at the rate of 100 gallons per head, irrespective of the minimum daily flow of the Croton River, of 27,000,000 gallons.

For the supply of the higher section of the city, north of the Manhattan valley, a high service reservoir is constructed, into which water is pumped by steam from the aqueduct near Harlem Bridge. And the very highest points are fed from a tank supported on a tower, near the last-named reservoir, at a height of 300 ft. above the sea. In 1882 the ordinary daily consumption of the city was 95,000,000 American, or ordinary wine, gallons of water; and the high service supply amounted to a further quantity of 11,605,630 American gallons. The cost of the works has attained the large figure of 7,000,000*l.*, or 5·84*l.* per inhabitant. The annual revenue was 343,000*l.*; or 5·7s. per head, and the working cost was 70,000*l.*, or only 1·14s. per head. The daily supply per inhabitant was 74 imperial gallons.

An instructive comparison of the two opposite methods of supply by gravitation and by direct pumping is afforded by the statistics of the water supply of Chicago and of New York. In the former, where 3·73*l.* per inhabitant has been laid out in the works we have enumerated, the cost of pumping to the height of 132 ft., and of the entire distribution, amounted (for an annual volume of 20,124 millions of gallons) to the incredibly low figure of 1·11*l.* per million. In the latter, where one-tenth only of the supply has to be pumped for about the same lift as at Chicago, the working cost for the delivery of 32,425 millions of gallons in the year 1882 was 2·18*l.* per million. The sum of 5·84*l.* per inhabitant had, as before said, been laid out on the works. If we allow the whole price of pumping and distribution at Chicago as an extra charge on the proportion of the New York supply that has to be pumped, we have a cost of 2·07*l.* per million gallons for the working expenses of the gravitation supply, including the maintenance of its large reservoirs, forty miles of aqueduct, and its other works, against a cost of 1·11*l.* per million for direct pumping; and this, too, with coal costing 28s. per ton.

It is thus evident that it is altogether idle to attempt to prescribe the cheapest method in which the water-supply of any given locality can be effected without due consideration of all the features of the case. It is, of course, clear at the first glance that, other things being equal, it is cheaper to supply water by gravitation than by pumping, independent of the extra strength of pipes and fittings that is required in the latter case. But the cost of the storage works has at the same time to be taken into account; and that both as involving interest on money and cost of maintenance. The interest on the New York gravitation-works, if taken per head of the population supplied, is, as we have shown, to that on the Chicago direct pumping works, as 5·84 to 3·73. But this is not all. The maintenance of these noble works, together with all the other working expenses of supply, raises the working cost at New York to nearly double that at Chicago.

Perhaps the nearest approach to a comparison of the same nature between towns of a certain magnitude in England is afforded by the cases of Worcester and of Plymouth. In the former city the water of the Severn, running through the place, is pumped to a reservoir, at a cost of 7·06*l.* per million gallons. In the latter, from works first constructed in the reign of Queen Elizabeth, the waters penned up in a mountain valley are conducted through a leet, or open channel, of some twelve miles in length, into reservoirs for distribution, close to Plymouth. The average cost is returned at figures that do not work out to more than 1·41*l.* per million gallons. Here the cost of maintenance is very low, and comparatively little has been done to aid the resources provided by nature herself. With these two localities as instances of the cheapest water-supplies in England may be compared the supply of Kingston-upon-Hull, where the water is drawn from two artesian wells, and pumped into service-reservoirs of a capacity of about two days' supply of the town. Here the working cost comes to 7·34*l.* per million gallons, which is close upon that at Worcester. For the Kent Company, among those of the metropolis, which also relies on pumping from springs, the cost comes to 8·95*l.* per million gallons. It is readily intelligible why cost should be higher in the last case than in the two former; but the comparison tends to show that the cost of our urban supplies is, for the most part, very closely approaching the minimum possible under the physical features of the case. The cost to the consumers, in the exceptionally favourable case of Plymouth, according to the figures given in the Return of Urban Water-supply (265, 1879), is at the rate of 7·01*l.* per million gallons, which is a lower figure than that in either of the great cities of the United States. Water is sold by meter at Plymouth for 2d. per 1,000 gallons, which is equivalent to 8·33*l.* per million. The rates outside the borough are 50 per cent. higher than within, averaging 3·33 per cent. on the rental. But the question of the amount of rate legally chargeable is always liable to so much complication, that any statement of it conveys little information, if compared to that mode of application which we have followed, viz., rate of cost per million gallons, and rate of charge per inhabitant; the two figures being connected with each other by the rate of daily supply. Correcting the population given in the Return of Urban Water Supply by the increase from 1871 to 1879, the cost of water per inhabitant at Plymouth is 2·4 shillings per annum, and the daily supply is 46 gallons per head.

MESSRS. BODLEY & GARNER'S DESIGN FOR LIVERPOOL CATHEDRAL.

WE give this week two of the external views of Messrs. Bodley & Garner's design for the proposed cathedral, that from the north-west, showing the grouping of the whole building in subordination to the great central feature, and that showing the western façade. To these we add the elevation of the east end and the south side of the building, and the plan. Of the interior perspective of the nave, from the crossing, which is the finest and most effective of all the drawings by which the architects have illustrated their design, we gave a reproduction in the *Builder* for January 9th.

The following is the full text of the architects' report, which is a short pamphlet only:—

"In sending the accompanying designs for the new cathedral at Liverpool, we beg to offer the following observations upon them as a report.

The building of a new cathedral for the City of Liverpool offers an architectural opportunity such as has not occurred in England since the erection of St. Paul's Cathedral, in London, in the time of Charles II. We think that no trouble or expense ought to be spared in order to make this present work as great a success as Sir Christopher Wren's noble church is admitted to be. We do not think that, in the abstract, it would be well to adopt the revived Italian style, which was the one almost universally employed in Sir Christopher's time, but would rather advise the national style, in which all our cathedrals, except this one, are erected, and which is so intimately connected with an Englishman's idea of a cathedral. Sir Christopher himself, in almost all his works, and notably at St. Paul's, shows great leaning towards these ideas, and we have no doubt that, had he lived in these days, he would have designed such a work in the English, rather than in the Italian manner. How far the proposed site may affect this question shall be considered later.

After the question of style, the plan and general arrangement of the cathedral have to be considered.

Here, again, it will be useful to refer to the Cathedral of St. Paul as the principal cathedral of great size and magnificence which has been built for the Church of England since the Reformation. Although the style of the old English cathedrals seems to us the best to adopt for a new one, yet, in many respects, they are unsuitable as models, on account of the different wants and requirements of the present day. We do not, therefore, advise an unreasoning imitation of their plan or arrangements, but rather an adaptation. In one particular, namely, the large circular space under the dome at the entrance to the choir (so suitable for receiving a large congregation who can easily see and take part in the service), and so convenient, also, for assembling them around and in the immediate neighbourhood of the pulpit, St. Paul's offers an excellent model. Fortunately one of our old English cathedrals shows how this useful feature can be adopted in the national style, and in the octagon at Ely we have the same arrangement, treated most successfully in the English manner, by the celebrated Alan of Walsingham.

This, however, was not a building designed *de novo*, but merely an adaptation of an existing church. In the present case we have the advantage of an entirely new design, and we think that the octagon we propose, with its eight nearly equal arches, would produce an interior effect which has not been obtained, as far as we know, in any cathedral yet erected in the world.

We think that the three spires would make a fine group. Lichfield is the only one of our cathedrals which, at present, possesses them, but they existed at many other English cathedrals two centuries ago, as at Lincoln and elsewhere, and may be considered as having been generally contemplated, if not executed. They could, however, be postponed if funds did not allow of their completion.

We must remark that, in our opinion, solid and massive piers to the nave are essential both to appearance and stability, and that their existence, in our design, should not be considered as a defect, because the use of the aisles, for congregational purposes, is out of the question in a church of this magnitude; and they must be considered as alleys or passages, and places for the reception of monuments,—a most essential part of a modern cathedral. We think it desirable to insist on the absolute necessity of providing a very large space for this purpose, as the number of memorials becomes so greatly increased in the course of ages, that unless there is very considerable room left, the church becomes greatly encumbered and disfigured; as is the case in Westminster Abbey, for instance.

We have kept the instructions to avoid elaborate and minute detail carefully before us; and we trust that the Committee will consider that our design does not err in this direction, the quantity of ornament being inconsiderable, compared with the dimensions of the building, and the size of the ornaments themselves being, in reality, very large. They are, in fact, larger than usual, though the small scale of the drawings makes it impossible to show this clearly. We should be quite willing, however, to simplify the design still further, in execution, if it should be thought desirable. We would, however, draw attention to the fact that the sides of the large and massive buttresses are of plain ashlar, and these, of course, do not appear on the elevational drawings. This would give a much greater appearance of solidity and plainness than might be supposed.

With regard to the dimensions of the church, we feel strongly that the cathedral church of so immense and populous, and at the same time so wealthy and important a city as Liverpool, should not be inferior in any way to the church of any other city in the kingdom. We have, therefore, designed a cathedral of the first class, and its height to the apex of the vaulting, 110 ft., is greater than any other church in England, though, of course, less than many foreign cathedrals. The style we have chosen is that of the early fourteenth century, and is of strictly English character. We cannot but think that the beautiful manner of our English architecture should be employed for this, which will be the most important ecclesiastical building that has been planned for many generations in England.

The general internal arrangements of the church do not seem to call for much remark. We think it essential that a passage should be kept all round the east end on account of visitors to the monuments and cathedral. We have placed the great organ at the west end, where it would be well heard, when played as a musical instrument merely; it might also be used on occasions when a large congregation was gathered in the nave. And a smaller organ, over the stalls, would accompany the choir. This organ would be played from the stalls.

In the planning of vestries, &c., we have indicated the general position and arrangement, but this could of course be modified to suit the practical requirements of the place. We should be happy to confer with the Committee on this point.

We have now to consider the requirements of the site, the nature of which presents a somewhat difficult problem.

On the plan supplied to us by the Committee the space allotted to the cathedral is not, in our opinion, quite sufficient. The church we have designed is, indeed, contained within its limits, and one bay of the nave could be omitted if necessary, but we feel that it approaches too closely to St. George's Hall, and that it would be most desirable to move it a little westward. The building could be slightly reduced in scale without alteration of the design, and so more space be gained if it is thought desirable. We have indicated this on a suggestive plan for the re-arrangement of the site, and there does not seem to be any difficulty in the way, as there is a large open space in front of the site already, which is now occupied by the weighing-machine. Of course it will be necessary to remove this, as it would not do to have this just at the west doors of the new cathedral. But we think also that the removal of the mean and unsightly modern houses at the west end is merely a question of time, and that a plan for the rearrangement of this portion of the town will form a part of the cathedral scheme. In our present plan, however, we should only require about 25 ft. or 30 ft. more, and this the open space at the west end easily affords us.

Another difficulty consists in the abrupt slope on which the building is to stand. We have arranged the necessary steps under the western porch, thus avoiding the difficulty of a long flight of steps between the carriage-road and the building, which, in wet weather, would be a serious inconvenience. The north transept we have also placed close to the road. We should recommend that an avenue of trees be planted, where we have shown it on plan, and that the rest of the ground be turfed and laid out with shrubs, the levels being made out by terraces and steps, which could be made to look very well.

Although we feel the advantages of the present site, and that it would be quite possible successfully to grapple with its difficulties, we think it should be a matter of careful consideration whether another site should not be selected, as the one proposed is certainly very confined. Another objection, and a still stronger one, to our minds, is the fact that the cathedral will stand half way up the hill which is crowned by the fine building of St. George's Hall. It will be difficult to give proper prominence to the one building without, in some degree, detracting from the dignity of the other, as they are in such close proximity.

This brings us to the consideration of how far the present site must affect the choice of style. Surrounded as it is by a series of unusually fine buildings of the Classic style, it becomes at once a question how far they should influence the style of the cathedral. We have no doubt at all that, for the reasons stated at the beginning of this report, a new cathedral should be English rather than Italian; but we also think that it is extremely important that the different uses to which the buildings are dedicated should be at once apparent. There is great danger that a group of buildings, arranged as they must be very closely, and designed in the same style, should be confused together. The cathedral must, of course, be the most important in every way, but it would not occupy the place of honour, which is already taken by St. George's Hall; and we think that it would be difficult, if not impossible, to prevent the latter from appearing a part of the former. Of course, the group would, architecturally, be very fine.

With regard to the nature of the material, we should be inclined to advise the use of the local red sandstone for the interior; using some harder stone, such as Dumfries, where required. The exterior would require a stone carefully selected for its properties in resistance to the smoke and chemical action, spoken of in the instructions. We should advise Portland, or one of the best hard stones of the north. This is a matter which ought to be carefully gone into by an examination of the various stones used in Liverpool, in order to ascertain which best resists the action of smoke and weather.

In conclusion, we beg to say that, if entrusted to us, this very important work should have our best attention.

We should be glad to confer with the Committee, and to offer any explanation of the design."

There is less temptation to indulge in *pros* and *cons* about this design than about the last one we illustrated, because the view of the problem adopted by the authors is a very simple and straightforward one, being merely to build a Mediæval cathedral in pure Mediæval style, and on the old lines. The only point of novelty in the design is the treatment of the crossing, which is, it is true, adapted from Ely in its main idea, but is novel in regard to the proposal to raise not only a much more lofty lantern, but a tall spire, over the octagon. To do this it has been necessary to occupy the angles of the octagon with very massive piers, which, when the congregation extends beyond the area of the octagon, must very much militate against seeing and hearing over a great part of the space lying outside it in the nave and transepts. In judging of this, however, it is right to bear in mind that the authors distinctly decline to regard the question from a utilitarian point of view. Their object, as is evident from the passage in their report where they justify the massiveness of the nave piers, is to produce a fine Gothic interior, the aisles not being regarded as for any purpose except as ambulatories, and as a space for the reception of monuments. Looking at the question from what may be called the Mediæval point of view, this is of course perfectly logical. In another passage, indeed, the authors speak of the old English cathedrals as being unsuitable as models, on account of the different wants and requirements of the present day, and as demanding adaptation rather than imitation. But we must candidly confess that we fail to see where the "adaptation" comes in. Here is a long narrow Mediæval nave of what may be called the processional type of church; and the octagon at the crossing cannot be called an adaptation, as it has been anticipated at Ely, to which precedent the authors especially refer, in terms which form a curious example of the way in which architecture is regarded now. "Fortunately," they say, "one of our old English cathedrals shows how this useful feature" (the space under the dome in Classic churches) "can be adopted in the national style," referring to the precedent of Ely. We should have thought the word would have been *un*fortunately," and that the architects would have regretted, on the principle of *pereant qui ante nos nostra dixerunt*, that Alan of Walsingham had been beforehand with them.

Messrs. Bodley & Garner, however, are fully entitled to their claim to have given a new and very fine treatment of Alan of Walsingham's idea. They have, as they say, the advantage of an entirely new building in which to work it out, whereas the octagon design at Ely was a modification of an existing building, not fully prepared in plan and foundation for such a treatment; and they are justified in saying that their central octagon, on eight lofty arches of nearly equal span, will produce an interior effect which has not been obtained in any other cathedral in the world. Some idea of it may be obtained from the interior view referred to, in the *Builder* of the 9th inst., and its construction will be seen when we have space to give the longitudinal section, which we are unable to find room for this week. There is ample verge of strength in the piers for the weight of the immense lantern (90 ft. in diameter to the exterior of the buttresses), and sufficient for the spire over it; but the superposition of the spire is a somewhat bold piece of construction, and would, at all events, require great care and calculation in carrying it out. The constructional spire, of course, starts much lower than the visible spire,—in fact, nearly from the base of the lantern where it clears the roof, but the thrust at the angles there would be very great (unless ties were employed, which is an undesirable way of bandaging up a building), and the mass of the buttresses is relatively rather small. No doubt it could be built, but it looks a little risky. The general outline and proportion of the central lantern and spire we think very fine; and both in this and the western towers the spires rise naturally as the culmination of a pyramidal composition, as we prefer to see them.

In presenting a design such as this, Messrs. Bodley & Garner, of course, put out of consideration the question of suitability to the adjoining buildings. Their idea is to make the cathedral contrast entirely with these; to give a vertical and pyramidal composition rising from among a mass of horizontal buildings. This is a treatment which has its *raison d'être*, and may be regarded as quite open to acceptation; though our own predilection would lean towards a treatment harmonising the structure with its surroundings. Generally the architecture of the design is an able and scholarly representation of the very beautiful phase of English Gothic selected. The interior is the most powerful portion of the design; the exterior, in spite of its great scale, impresses us as rather graceful than powerful. The treatment of the choir internally owes a good deal to suggestions, or more than suggestions, from Lincoln. The architects have shown themselves fully aware of the value of deeply-recessed porches at the entrance, and the detail of these porches, as will be seen in a drawing we will give hereafter, has been

worked out with the perfect knowledge of and feeling for that style of Gothic which might be expected from its designers. The question whether a pure imitation of Mediæval architecture and of a Mediæval cathedral should be adopted on the present occasion depends upon a number of considerations, some of them ecclesiastical rather than architectural, which we have already endeavoured to indicate. Upon purely architectural grounds we cannot but feel, as we said some years ago in regard to Truro Cathedral, that it seems to us a matter for regret that a modern cathedral should be built merely as an imitation of an ancient one, and with no attempt to work out new ideas and materials in a new form. We should be inconsistent with what we have always felt and expressed as to the need for progress and an endeavour after originality in modern architecture, if we adopted any other view; but we say this in full recognition of the admirable way in which the authors of this design have treated it from their own point of view.

We have not thought ourselves in any way called upon, in the remarks we have ventured to make on these three designs for such an important work, to express any decided opinion in favour of the adoption of one or other of them. The committee have an excellent adviser in Mr. Christian, and one whose fairness and impartiality may be depended upon; and, if we have any decided opinion in favour of one more than another, we prefer to leave it to be read between the lines. We have endeavoured to do justice to the fine points in each, and to draw attention to some of the considerations in regard to site, practical suitability, and æsthetic, which appear to us to be of special importance.

NOTES.

WE printed in our last number (p. 181) an important report of the Special Purposes and Sanitary Committee of the Metropolitan Board of Works, containing a large number of recommendations with respect to the cleansing and ventilation of sewers. In general scope these recommendations are commendable and likely to be productive of much good if adopted. We say this without unreservedly supporting every detail, but we think it very doubtful whether the local authorities will be able to secure the intelligent co-operation of householders in the way indicated in the fifth paragraph. The report was presented to the Board at its meeting on the 22nd inst., and the Chairman of the Committee (Mr. Alfred Pocock) was proceeding to move its adoption *en bloc*, when one or two members urged that the matters dealt with were of such importance that before the Board sanctioned the recommendations of the Committee the report should be referred to the various vestries and district boards of works for their opinion. After some discussion, it was decided to postpone the consideration of the report for six weeks, so as to give time for eliciting the views of the various local bodies in question. Seeing that these bodies are upwards of forty in number, what chance is there of unanimity of action in regard to such important matters of sanitary administration as those dealt with by the report?

LORD HENNIKER'S Railway Rates Committee has lost no time in discussing the course of action to be taken during the present Session, and will request the President of the Board of Trade to receive a deputation. The intimation conveyed in the Queen's Speech of the intention of the Government to deal with this matter was regarded as satisfactory and encouraging, and it will be interesting to see what success will attend the efforts of the Government to deal with a question which their predecessors have been unable to solve. The same subject occupied the attention of the Nottingham Chamber of Commerce at their meeting last week, when Mr. J. E. Ellis, M.P., while denouncing the Rates and Charges Bills of last year in no measured terms, urged that Imperial legislation on the subject was imperative. When this matter was about to come before the House twelve months ago it was remarked by the *Times* that the railways had hitherto acted very much according to rule of thumb, but that, on the whole, rough equity had been done. Even if the latter part of this statement be true,—and there are many who would not allow that it is so,—it must still be admitted that such a state of things is not at all satisfactory, and that there is no guarantee for this questionable equity in the present uncertain state of the law. It is certain, however, that the subject is much better understood than at this time last year, and we may look forward to practical results when it is again before the House.

IN another column we report the result of the election of District Surveyor for the Western Division of the City of London, rendered vacant by the death of Mr. Rawlinson Parkinson. The appointment has fallen to Mr. Hugh McLachlan, to whom we offer our congratulations. He had been a candidate of long standing for such an appointment, and on previous occasions had been all but successful. The election which took place on the 22nd inst. was a little more exciting than usual, for it was rumoured that the son of a well-known member of the Board was likely to get the appointment, although this was only his second application. A proposal to vote by ballot on the six candidates selected from the thirty by the preliminary voting was negatived, and the voting proceeded in the usual way. The fact that the candidate in question received the highest number of votes in the preliminary voting was not reassuring, but when the second vote was taken it was evident that the majority of the members of the Board were not about to perpetrate an injustice. From the fact that the favoured candidate who has thus early obtained so good a place in the voting holds the certificate of competency granted by the Institute of Architects, it may be assumed that, technically, he is fully qualified to hold such an appointment, which we hope he may one day obtain; but we trust that the members of the Board will recollect that before this gentleman's turn comes there are other candidates considerably his senior, both in age and in length of candidature (to say nothing of experience) who merit consideration.

THE Plumbers' Company have, as will be seen by a report which appears on another page, succeeded in enlisting the earnest support of the plumbing trade of London in favour of the movement for the registration of all competent plumbers, whether masters or men. Although it is intended that the work of registration shall be confined to the City of London and seven miles round in the first instance (those being the limits imposed upon the action of the Company in its Charter), facilities for registration will be extended to all the large provincial towns with as little delay as may be. Pending the completion of these arrangements, however, it will be competent for plumbers from any part of the United Kingdom to be registered in London upon proof of their fitness. Although the meeting of the trade on Monday last was called at a very inconvenient hour for working men, the operative plumbers of London were well represented, but it was stated that, in consequence of the importance of the question, some of them had to leave their work to attend the meeting, "at the peril of the sack." Representatives from the provinces expressed the eagerness of the provincial plumbers to take part in the movement, and these expressions were repeated at the meeting of the General Council held on Wednesday afternoon, the Lord Mayor in the chair. From the resolutions adopted at both meetings it will be seen that there is some prospect of an early commencement of the work of registration. In the course of Wednesday's proceedings, Mr. Philip Magnus quoted some figures which showed that since this question of registration was mooted by the Plumbers' Company, the number of students of the technology of plumbing has considerably increased. Mr. Magnus also referred to the excellent work, in the shape of technical education for plumbers, which has been initiated and carried on for some time in Dublin, by Mr. Maguire, of that city. Although the classes established by Mr. Maguire were originally intended solely for the benefit of his own workmen and apprentices, he has, in a very liberal spirit, extended their benefits to other workmen. It is satisfactory to see the masters and men of the plumbing trade vieing with each other in promoting sound plumbing,—a branch of building work which, as the Lord Mayor observed, concerns us all very closely. Mr. George Shaw, the Master of the Plumbers' Company, has succeeded in enlisting the help of many well-known architects and sanitarians in this important movement.

THE question of a name for the new street from Piccadilly-circus to Bloomsbury was discussed at the meeting of the Metropolitan Board of Works on the 22nd inst. The proposal of the Works and General Purposes Committee to call the street "Piccadilly-road" was strongly opposed and ridiculed by some members of the Board, as it deserved to be. Equally absurd was the suggestion to call the new street "Piccadilly-east." It was pointed out that the new street ran north-east from Piccadilly-circus, and that, if any street in the vicinity was to be called "Piccadilly-east," that street was Coventry-street. To both names it was objected that the new street, cutting as it does through somewhat squalid neighbourhoods, had nothing in common with Piccadilly. The name "St. James's-avenue" was suggested by Mr. Bonthron, the new representative for St. James's; a better name than this would be "Soho-avenue." Ultimately, the question was referred back to the Committee for further consideration. Now, seeing that the Board at the same meeting decided to grant a site for a statue of the late Lord Shaftesbury in the centre of the circus which is to be formed at the intersection of the new street with the new street which is to be made from Tottenham Court-road to Charing-cross, we think, with a correspondent of the *Times*, that the street may well be called "Shaftesbury-avenue." In this way, means will be found for perpetuating the name of the distinguished philanthropist in that of the new street, which, it should be remembered, for part of its length passes through a district (viz., St. Giles's) in which he took great interest.

AN important paper was read before the East India Association, on Wednesday last, by Mr. Henry Stanley Newman, on the subject of "Water Storage and Canals in India: How far they are Preventive of Famine." Lord Harris, the Under-Secretary of State for India, presided, and in his address congratulated Mr. Newman on the exhaustive manner in which he had treated his subject, and in which he himself greatly sympathised, though he was unable to coincide with all the statements made. He added that he considered the lecturer had not appreciated all the difficulties with which the Government of India was beset, owing to the limits which were assigned to their borrowing powers, and the jealousy with which the House of Commons viewed expenditure in India, when he attributed to them a failure in the vigorous prosecution of irrigation works. It was, of course, the duty of the Secretary of State to exercise a rigid scrutiny of all the projects submitted to the Home Government for sanction, and that, rightly or wrongly, he could only approve such as in the judgment of the Council appeared likely to advance the interests of the country without unduly adding to the burden of taxation which, in the opinion of those best qualified to judge, had nearly reached its possible limits.

FROM a report which is given in another column, we are glad to see that the Metropolitan Board of Works has at length shown a disposition to recognise the fact that there is a method of building walls with concrete, and to make by-laws to regulate it, instead of regarding it as an unwarrantable

and illegal proceeding. The determination comes rather late in the day, and seems to have been forced on the Board by the refusal of a magistrate to uphold the action of the Board's officials against a man who had dared to build in concrete,—a case on which we commented at the time.

IN the *Century Magazine* for February Mr. M. G. Van Renssalaer contributes an interesting article on recent architecture in America, illustrated by some very well-executed woodcuts. We recommend it to the notice of readers interested in architecture, professional or lay. There is plenty of evidence in the illustrations of the progress of a desire for originality and picturesqueness in architectural treatment in the States. Suggestions seem to be taken at present from the architecture of all times and countries, not always with the best judgment; but these elements may be harmonised in time into something like a distinct American style. In some cases, as in "Mr. Tiffany's House, Madison-avenue," there seems rather too obvious an effort to pose as "rough" and "picturesque." Certainly no one would imagine this was a town house in an entirely modern city; but it is better than being commonplace, at any rate.

A DISCOVERY of great importance for the chronology of vase-painting has just been made at Athens, and is reported in the *Ἐφημέρις ἀρχαωλογική*. Among some architectural remains, which are certainly of pre-Parthenon date, have been found buried certain fragments of pottery bearing the familiar signatures of the two famous potters, Hieron and Duris. It will be remembered that the vases bearing these signatures have been, so far, found exclusively in Italy. The great interest of the discovery lies, of course, in the fact that it fixes securely the date of the potters. Dr. Klein, in his brilliant essay "Euphronios," dated the whole group of potters connected with Hieron and Duris between 490 and 440 B.C., and here come the fragments themselves to give certainty to his conjecture. The same journal publishes some interesting fragments found in the excavations at Epidaurus. Among them a young warrior; a head, probably of an Amazon, but much damaged; some figures of Nike, which have evidently surmounted acroteria, and, therefore, of great interest in connexion with the question of the Nike of Pæonios; two standing figures of Æsculapius; and a relief of a seated Æsculapius which Dr. Kabbadias (the new inspector of antiquities) thinks is a rough copy of the chryselephantine statue of Æsculapius in the sacred grove at Epidaurus. Pausanias, it will be remembered, saw the statue, and describes it as "seated on a throne, and holding in one hand a staff, and with the other laid on the head of a dragon. A dog is represented at the foot of the statue."

THE Comptoir d'Escompte of Paris is sending M. Thevenet, an engineer, to China, to offer to the Chinese Government, on behalf of a syndicate of bankers, a loan of 800,000,000 fr. for the construction of 2,000 kilomètres of railway. The resulting price, of nearly 26,000*l.* per mile, is about that of an average mile of railway in France, where the gross revenue averages 10·6 per cent. on capital cost. With the dense population of China better results may be expected on well-selected and well-constructed lines.

THE *Bulletin Epigraphique* (v., No. 4) reports the discovery of a long lost relic,—the so-called "stone of St. Thomas of Canterbury." It has turned up suddenly in the sacristy of the Domkirche of Siena. It is a gem about 3 centimètres long and 3 broad, and to it is attached a bit of parchment bearing the words, "De lapide super quem sanguis beati Thomæ Cantuariensis effusus est"; but the odd thing is that the gem itself bears the inscription, "Severi Anicetrum . . . . spodiacum," which stamps the gem as the signet of a Roman oculist; so St. Thomas à Becket only hallowed the relic with a second association.

UNDER the rather ambitious title of *Les Lettres et les Artes*, Messrs. Boussod, Valadon, & Co. (the successors of Goupil) publish in Paris a new illustrated review, commencing with the present year, and which includes illustrations, prose articles, poetry, and musical compositions. Among the contributors are M. Edouard Pailleron, who contributes a lively little story of the literary effort of two young "Poètes de Collège," who sent off their first manuscript play for the opinion of the greatest French poet, with the brief address, "Victor Hugo—Ocean"! (this was in the poet's Jersey days); M. Ch. Gounod, who writes a very interesting disquisition on sacred and secular music, to accompany an illustration of M. Dubufe's fine diptych picture "La Musique sacrée et la Musique profane"; M. Widor, who contributes a musical setting of a poem of Sully-Prudhomme's; and M. Jules Simon, who writes an interesting and thoughtful article on "Les Logements d'Ouvriers." The review is beautifully printed, with fine type and wide margins,—a "revue de luxe," in fact, but its great merit lies in the illustrations, which in beauty of execution, for work of this kind, could not well be surpassed. The new "Revue" does not aspire, we imagine, to occupy the rank of the more weighty periodicals; but from an artistic point it is a charming publication.

THE "*Εστία*" states that a new Central Museum is to be begun at once at Athens, and is to be reserved exclusively for such antiquities as are found within the limits of Athens itself and its immediate surroundings. Whether it is proposed in connexion with this new museum entirely to rearrange the already-existing museums, such as the Acropolis Museum and the Patissia Museum, and the collections of the Archæological Society, is not yet stated. It would obviously be of advantage, both to students and archæologists, if the distinctly Attic remains could be kept together. It is proposed that the museum should also contain Attic inscriptions and casts of Athenian antiquities in the possession of other nations.

THE Art-Union of London has issued to its subscribers this year, in lieu of the usual plate, a handsome edition of Scott's "Bridal of Triermain" (oblong folio), with fourteen plates, from sketches in black-and-white by Mr. Percy Macquoid, R.I. The illustrations are reproduced in a very effective manner, but we cannot much admire the designs, which strike us as mostly very theatrical in style.

OUR American contemporary, the *American Architect and Building News*, in its issue for January 2, comments on a supposed act of injustice on our part to Messrs. Osgood, the publishers of a portfolio of Mr. Richardson's designs for Harvard University Law Schools, in not giving their name when we mentioned and reproduced some of the designs. It is a mere misconception. We were not aware that it was a publication sent for review by the publishers; we supposed that the architect, Mr. Richardson, had sent us a portfolio of his designs, and we asked his permission to reproduce two or three of them to show what was doing in American architecture, which he gave. Of course any book or publication sent for review by an American publisher would be duly credited to the firm that sends it.

THE collection of new French and Dutch pictures at the Goupil Galleries, in Bond-street, includes an immense picture by Benjamin Constant, covering nearly a whole side wall of the gallery, entitled "Justice in the Harem," and as remarkable for splendid colour and general power as for the sheer brutality of the subject. It represents a heap of more or less naked bodies of women who have been slaughtered, and whose blood lies about the floor of a gorgeous Moorish interior, and trickles into the basin of the fountain in the middle of the floor. For what sort of public are pictures of such hideous subjects, on such a scale, painted, and who buys them? There are several good works by Bouguereau, among them one, "An Echo from the Deep," a well-nourished nymph kneeling in a sea-cave, and holding a shell to her ear, which as a piece of drawing and painting of the figure, is very fine, but has not a touch of sentiment: Bouguereau seems to reserve all his sentiment for his peasant subjects, and leaves us mere realism just where we look for idealism. "Loups-de-Mer" ("Sea-Dogs"), a large interior with figures of seafaring men, by Madame Demont-Breton, is a fine thing, a little in the manner of Israels,—rather too large, however, for its subject. There are one or two good landscapes.

THE so-called "Salon Parisien," which opened its second year's exhibition a few days ago at the gallery in Bond-street, exhibits less ability, and even more vulgarity, than last year, and the promoters have fairly succeeded in degrading art to the level of a "peep-show." The only things we saw there with any pleasure were two water-colour studies by M. Dubufe, junior, for decorative paintings, which are very charming, and worthy to be in better company.

METROPOLITAN RAILWAYS AND OTHER SCHEMES.

THE Bills in Parliament affecting the metropolis are much fewer in number this session than they have been for some years past, and seem to indicate that capitalists are seeking some other means of investment than railway or building schemes. The total number of these Bills is only thirty-one, as compared with fifty-seven last year, and fifty-five in the preceding year.

Three short lines of railway are proposed to be constructed within the metropolis, viz., the Bexley Heath Railway, which is about a mile and a half long, and two new junctions about a quarter of a mile long, near the New Cross Station of the London, Brighton, and South Coast Railway. There are eight new tramways about twenty-two miles long, two of which are proposed to be laid from the Archway Tavern, Holloway, to Finchley, along Highgate Archway. The South Kensington and Knightsbridge and Marble Arch Subway and Knightsbridge Improvement Company propose to construct an underground railway, or, as it is the fashion to call it, a subway, about a mile and a half long from Exhibition-road, South Kensington, under Hyde Park, to Oxford-street, near Park-lane, and to form two short streets near Knightsbridge Barracks.

By the Horse Guards Avenue Bill it is proposed to construct a new street from Whitehall to the Victoria Embankment. The house at the corner of Whitehall-yard, until lately the residence of Lord Carrington, and illustrated in the *Builder* more than a year ago [see vol. xlvii., pp. 200-201], is proposed to be removed, and the site thrown into the entrance to the new street, which will be between 89 ft. and 84 ft. wide at its western end, and for the remainder of its length 60 ft. wide. (For a plan of the proposed street see the *Builder* for Dec. 5 last, p. 803). Power is reserved in this Bill to enable the Metropolitan Board of Works and other public bodies to enter into arrangements for carrying out the whole or any part of the works.

Two small street improvements, for widening Cold Harbour-lane, Camberwell, at its junction with Denmark-hill, and the extension of Munton-road to Rodney-street, New Kent-road, are included in the Metropolitan Board of Works (Various Powers) Bill. The Board also propose by the same Bill to provide a more direct communication between the Victoria Embankment and the Charing-cross foot-bridge by means of a flight of steps adjoining the Charing-cross Station of the Metropolitan Railway.

The Corporation of the City of London propose to convert the Central Fish Market into a market for fruit, flowers, vegetables, fish, meat, poultry, corn, hay, and other produce, and have introduced a Bill into Parliament fer that purpose and for enlarging the existing market.

The Southwark and Vauxhall Water Company have re-introduced their Bill for the construction of a new service reservoir at Honor Oak-hill. This Bill passed the Committee of the House of

Lords last Session, but did not reach the second reading in the House of Commons.

A Bill has been deposited for the enlargement of Hampstead-heath by the acquisition of Parliament-hill, Parliament-fields, the Elms, and East Park Estate, comprising an area of about 274 acres. It is proposed that the land shall be purchased by the Metropolitan Board, and power is given to enable the City and any of the Vestries or District Boards to contribute towards the cost of such purchase.

The Greenwich and Millwall Subway Company propose to take powers to raise further capital and to transfer their undertaking to the Metropolitan Board of Works.

THE SPANISH AND PORTUGUESE SYNAGOGUE, BEVIS MARKS.

AT the well-nigh universal celebration which ushered in the 8th of Heshvan, 5645 (on Sunday evening, October 26th, 1884), being the centenary of the late Sir Moses Montefiore, the principal service in London was that which was held by the Rev. Dr. Hermann Adler, delegate Chief Rabbi, and others in the Spanish and Portuguese Synagogue, Bevis Marks.* An elder thereof since 1814, Sir Moses had belonged to this, the Sephardic, congregation for eighty years; and in their temple he was wont to offer up prayer before setting forth upon his several journeys to relieve his brethren abroad. The congregation claims to be the oldest in Great Britain, and to lineally represent the small band of Jews who, led hither by Rabbi Manasseh ben Israel, after his escape to Amsterdam from the Inquisition at Lisbon, were established here under Cromwell's favour (1655). It is on record that the Jews abroad had offered to Cromwell a sum of 500,000*l.* for a safe return, and certain privileges,—the latter to comprise the use of St. Paul's Cathedral for their own place of worship. But since 800,000*l.* was stipulated for, the negotiations fell through. Some writers date their general re-admission from the Restoration. According to their own chronicle the first Portuguese synagogue was built in King-street, Duke's-place, in 1656,—the existing synagogue was erected in Bevis Marks, and the learned Dr. Nieto appointed Chief Rabbi, in 1701. With an interior more imposing, though less capacious than that of its neighbour, the Great Synagogue,† this structure, whilst possessing no striking architectural beauties, is a pleasing specimen of real Queen Anne style; and is said to contain a beam presented by that sovereign. The fine central candelabra, of old Dutch work, should not be overlooked. Its registers and vestry-room walls carry the names of Disraeli, Ricardo, Bernal, Lopez, Aguilar, and others that have contributed to the making of our history; besides some of purely Jewish note, such as Nieto and Abendana, the Rabbinists, with the Abarbanels who claimed descent from the royal line of David. Amongst the lists of those who have served as *Parnassim* is that of Benjamin Disraeli, with date 5577,—1817 A.D. He was probably Lord Beaconsfield's grandfather. About that time his son, Isaac, seceded from the congregation, and eventually from the communion, owing to a rupture on this very question of assuming office among the *Parnassim*. The oft-disputed date of his son Benjamin's birth stands in the register under date 1804, which can be taken as deciding the matter. We may here mention that, whilst his reckoning does not quite tally with our own, a correspondent, who should be well informed on this point, tells us that the synagogue is at this date exactly 204 years old.

But the poorer members of this community are gradually driven further eastwards; for their wealthier co-religionists a Spanish and Portuguese synagogue has been provided in (No. 57) Bryanstone-street, Bryanstone-square. It is contemplated to remove the synagogue and schools into the remoter East of London. The trustees,—albeit, so we learn, not unanimously,—have invited tenders for taking the property, either in whole or in portions, on building lease for eighty years from Lady-day next. The premises, being freehold and within the City, include Nos. 10, 11, 13, and 14, Bevis Marks; and Nos. 1, 2 (the girls' and the infants' schools and the almshouses), and 2½ (the Jewish baths), Heneage-lane.* Covering an area in all of, say, 20,580 superficial feet, the ground lies north-east by south-west at the angle of Bevis Marks and Heneage-lane (facing an end of Duke-street), with frontages thereto of about 128 ft. and 208 ft. respectively. James-court, opening out of Bury-street, to the south-west, is a *cul-de-sac*, but could be converted into an additional approach; the frontage here is nearly 90 ft. An open courtyard surrounds three sides of the synagogue which, on the fourth side, abuts at right-angles against Heneage-lane. Access is gained thereto by the schools in the lane, and through the gates and cart-way between Nos. 10 and 11, Bevis Marks. We should observe that the City Commissioners of Sewers have agreed to acquire a slip off the now sites in Heneage-lane in order that this thoroughfare may be widened to a uniform width of 24 ft.

* Mrs. Rachel Prussac, a Jewish lady, aged 103 years, was present.

† Established (1692) in St. James's (*prius* Duke's) place for German, with whom are now amalgamated the Polish, Jews. The present building dates from 1790.

* Stow says that Thomas Heneage and Sir Thomas, his son, held, since Bury Abbey was dissolved, the property here, which passed from the Bassets to the abbots of Bury. Hence Bury's, or Bevis, Marks.

SOME LESSONS FROM OLD GLASS.†

IT has been contended that to carry the picture, or whatever it may be, across the lights of a window is a practice altogether indefensible. But to confine the design of each separate light within the mullions is, in many cases, to insist either upon subjects on a very small scale, or upon single figures, standing each in its own little niche. Now the standing figure scheme, with its rows of saints ranged in solemn order round the church, is a very satisfactory one, and may, as in the clearstory at Bourges, be even imposing in its effect. It did good service, from first to last, throughout the Gothic period; and will serve for all time. But it is not all-sufficient; and one may surely aspire sometimes to subjects on a similar scale. Such subjects were evolved very naturally out of the foregoing scheme of single figures in separate lights. Two such figures might obviously bear some more particular relation one to another than that of a series of prophets, apostles, evangelists, or what not. They might represent (as they sometimes did) the Virgin and the angel Gabriel; and thus we have, almost as a matter of course, an "Annunciation" subject in two lights. If this chanced to be enclosed in a two-arched canopy, with a central shaft bisected by the intervening mullion, no reasonable objection could be taken to such an extension of the subject.

Very often there was no such obvious acknowledgment of the stonework; but in any really decorative composition the mullion is acknowledged, by the very grouping of the figures and the arrangement of the accessories.

It would be hard lines, having once seen what breadth and largeness of style may be gained by over-stepping the limits of a single light, to have to go back to the rigid system of what may be called the separate-cell treatment. The mullion is to be acknowledged, but that is not to say that it is in every case to be emphasised by the glass-painter. It must be remembered, too, that in the actual window the mullion is a much less formidable division than it appears on paper.

The rightness or wrongness of it all lies in the way the thing is done. There are compositions in plenty which are quite unjustifiable as window designs, the work of men who did not care, perhaps who did not know, enough of glass to concern themselves greatly about mullions, any more than they bothered their heads about leads and saddle-bars. But in the hands of men bred up in the exercise of this particular craft, and who had always before them the effect of their design in the glass, it has been shown abundantly possible to produce a window in which the design is carried across a number of lights, and where the effect is not impaired by the mullions,—for the simple reason that they have been duly taken into account. If they do interfere with the design, then the design is in fault. That seems to me the simple test of the fitness of the proceeding. Let those who *can* distribute their design, whether ornament or figure-subject, over as many lights as they please.

There is one practice of the pictorial glass-painters which seems to me not rashly to be followed. They were in the habit of filling the window with a picture without any border or margin whatever to separate it from the stonework. Some sort of framing to the subject appears, however, to be absolutely necessary. For the actual mouldings framing the window go for nothing in the effect of the glass; the stonework tells only as shadow; and any design, therefore, which counts upon the masonry to frame it is bound to be disappointing in the glass. There are some windows in the Laurentian Library at Florence, by Giovanni da Udine, which illustrate very forcibly this defect. Relying upon the rather elaborate, canopylike, stone-framing of the windows he has simply treated the glass as so many panels, which he has painted with his usual grotesques and arabesques, glazed after the manner of the period, quarry-wise. In the drawing of the elevation this was, no doubt, all very well; but the glass has simply the appearance of being unframed.

Some sort of frame is as necessary to it as to a picture,—the nature of that framing is another question. It is in many, if not most instances, desirable that it should have some architecturesque character; but that is not to allow that it should be architectural. The everlasting canopy I look upon as a weak device of the architect (I had almost said of the Enemy), either because the artist was compelled by the master-builder to provide some sort of architectural setting to his figures, as in the funny little pent-houses which figure in the earliest glass, or because, as in the stupendous structures in the latest windows, the designer was an architect and must needs find room for architecture even in his glass.

It is a matter almost of course that, in making attempts in a comparatively unaccustomed direction, we should resort to the familiar expedients and devices which have served us so well under other circumstances: see how in her attempts at decoration the lady amateur resorts straightway to drapery, and all manner of derivatives from dress-making and millinery, in which she feels herself at home.

The architect, inasmuch as he is an artist, produces something artistically fine, however ill-advised; but his architectural forms in glass are a misapplication as perverse as the flimsy feminine expedient of upholstery in house decoration.

The Early Gothic canopy in glass is to me childish. The Decorated canopy is a misproportioned monster, dwarfing the poor little figures it is supposed to honour. As to the Perpendicular canopy, which more nearly approaches the forms of stonework, or (as in Germany) those of metal-work, it is sometimes marvellously beautiful in effect, framing jewelled pictures in a setting of silvery white. But this effect is due largely to the quality of the white glass so abundantly employed; and might, I believe, be equally arrived at by the use of ornament of more intrinsic interest and beauty. Certain Renaissance canopies,—some I remember at Rouen and some in Italy,—consist practically of arabesque ornament, just sufficiently taking the form of a canopy to be classed under that head. These are as satisfactory as they are unlike the common type of canopy,—they are successful, that is to say, in proportion as they are un-architectural.

The huge altar-like structures of the later glass-painters, the finest of which are those at St. Gudule, are effective at a quite exorbitant expense of light and brilliancy. The men who were capable of designing them, could surely have obtained this much, and more, by means less open to objection.

The ready resort to the cheap expedient of the architectural canopy, seems to me to imply, if not a lack of invention, then at least a disinclination to take the pains to invent.

The framing cartouche of the seventeenth century, again, scarcely commends itself by its results in glass. It depends for its force far too much upon shadow to be of any great use to the glass-painter.

I would plead for the more abundant use of ornament as a frame for figures,—and, indeed, for ornamental design with little or nothing else. I am bound to confess that, apart from any significance or beauty of form in figure-work, it is usually more interesting than so much ornament,—if only on account of the greater variety and unexpectedness of the colour masses: it is so much easier in figure design to keep clear of that monotony into which repeated ornament is perilously inclined to fall. Indeed, the difficulty with figures

† Continuation of a paper, by Mr. Lewis F. Day, read before the members of the Architectural Association on the 15th inst. See p. 156, *ante*.

would be rather in observing symmetry of colour, were it needed.

The question arises whether this sameness is a sin inseparable from purely ornamental design?

I think not. But it is not easy to avoid a certain monotomy in ornament pure and simple; and then the economy that is effected by frequent repetition of the same forms is a temptation, not perhaps irresistible, but seldom altogether resisted. Still less easy is it to say shortly how to get variety and interest of colour apart from figure design, which, so far as drawing is concerned, is in many windows thrown away. So far as its meaning is concerned, one might express enough of thought, even without figure-work or with very little of it; and, moreover, we are concerned now with the beauty of glass as it appeals to the eye: its sentimental, historical, or intellectual interest is a thing apart.

Ornament, undoubtedly, has a way of being too ornamental, or, I should say, too formally ornamental. It is difficult so to distribute it that its order shall not be too apparent, its symmetry too exact. The scheme of design that one can take in at a glance is too obvious to arouse any interest. There is nothing in it to keep up our expectancy. Now in figure-work we are sure to find patches of unforeseen colour which give point and interest to the underlying scheme. The patches of the ornamentist are apt to be mere spots, recurring with irritating frequency and regularity.

A good scheme of colour is usually simple enough as it first occurs to the artist's mind. But he is a very simple artist who lets it too easily be seen in his finished work. It is the business of art to disguise the artifice, so that it takes time and patience to unravel all the secret of the colour whose charm one can feel from the first. And this process of mystification is much more difficult in ornament than in figure design, where the very nature of the subject suggests innumerable deviations from any set scheme of colour. (So also the introduction of coats of arms, and all manner of heraldic devices, is a never-failing source of variety and interest of colour.) But because it is difficult to get variety enough in mere ornament, it does not follow that it may not be done. I am convinced it might very well be done, and would be, if the artist were not always so tightly bound by the consideration of price.

Because ornament can be executed more cheaply than figures, it is adopted by a generation which, with all its gush about "decorative art" does not in its heart care one single straw about ornament, merely for the sake of economy; and, that being so, the minimum is, of course, to be spent upon it. Figures if possible, good or bad; if not that, then birds and flowers perhaps; but as for ornament, who cares or knows anything about anything? It is so much padding. Yet it seems to me that architects at least, who must know something of it, might more often adopt glass of ornamental character, — not on account of its cheapness, but because, for the price of indifferent figure-design, they could get, if they but took the pains, good ornament; and because, whilst good figure-work is, and must be, exceptional, bad figure-work is even less endurable in the eyes of an artist than bad ornament.

The form of ornament adopted in glass must be, of course, in harmony with the surroundings of the window; but it need not, therefore, be in imitation of any past period. Good Renaissance glass in Gothic churches, and in Gothic windows, too, does not strike us as being out of place. The mistake that is made in modern attempts at "style" is in copying without selection the examples of that style, faults and all. Every vice is condoned by the stylist, if only it is of the period. And because the Renaissance glass-painter happened not sufficiently to consider the nature of the material he employed, that is taken as an adequate reason why modern glass of Renaissance style should err in like manner. It is not a mere fancy of my own that the forms of a period may be adopted without following always the faulty manner of that period. Renaissance ornament in glass is sometimes glazed in a manner as strictly mosaic as any thirteenth-century glass could be; but this kind of thing is not "typical" enough for your imitator of the sixteenth century. If it is asked, is it then the exceptional instances that we should take for our example? I answer, yes: the best is always exceptional.

For my part, I would glaze up coloured work invariably, of whatever period, much as the early glass-painters did, without ever affecting any of their rudeness. In grisaille, on the other hand, and especially in domestic work, I would, except in very large windows, model my practice more upon the later artists, whilst avoiding their heavy painting and the florid forms of the debased period in which it was their misfortune to live. Because the men of one period borrowed the forms of stone or metal-work I would not on that account restrict myself to such forms. Whatever is convertible into good glass seems to me fully to the purpose. I would glean ideas from whatever country and whatever period they were to be gathered, and take a hint from woodwork, inlay, tapestry, mosaic, embroidery, damask, or whatever else might be suggestive of an effect worth rendering in glass. On the walls are two or three studies in the way of "translation" into glass. There is one showing large pieces of varied ruby glass, framed in white, something after the manner of the marble wall-panelling of Venice. I do not see why we should not take advantage of the beautiful variety of colour which often occurs in a sheet of glass. Another sketch (see lithograph in last week's issue) is based on a somewhat similar idea, in which the central panel of coloured marble is replaced by a patch of red made up of flames and demons, — the kind of thing one would not dream of submitting to a sober "client,"—but it amused me to do it. Then there is a scrap of ornamental glass (fig. 1), taken this time almost literally from old Spanish embroidery.

Fig. 1.—Translation of Old Embroidery Pattern into Glass.

Fig. 2.—Showing adaptability of a Panel by P. Flötner to Glazing.

The adaptation of a panel (fig. 2) by Peter Flötner (designed presumably for engraving on metal) is meant to show how it lends itself to a kind of glazing in which the leads form, as it were, the skeleton of the design, and are lost in it. This kind of thing almost suggests itself, it is so obvious.

There is a certain common kind of modern work based on the same idea, in which the leads are made to form the stems and stalks of rather conventional foliage, with leaves and flowers springing from them. This is in theory so simple that one wonders almost that such was not from the beginning the ordinary basis of ornamental design. But the scheme is not so simple in execution as it seems. There occur, most likely, other leads not forming part of the design, and when some of the glazing lines are meant to count and others not, the result is slightly distracting.

It is, no doubt, possible to invent designs which include all the leads necessary for the purposes of construction; but that is by no means an easy solution of lead-line difficulty. It demands very great cunning in design, and it can be better done by the adoption of purely ornamental forms (such as Flötner used or the Arabs from whom his inspiration was derived) than with floral forms, which leave the designer so much less free.

Time fails to touch on the suggestiveness of Oriental art. There is something very significant in the Arabian treatment of coloured glass, to say nothing of Eastern pottery, metal work, jewellery, and lacquer. The Italians of the fifteenth and sixteenth centuries had the wit to borrow freely from all manner of fabrics introduced into Italy from the East. And it was from thence they derived the idea of geometric tesselated mosaic, the forms of which, being also ready-made to the glaziers' hand, they reproduced again very judiciously in glass. (There are instances of this at Assisi and elsewhere.)

But, after all, it was little enough of their energies that the great Italians devoted to the cause of glass-painting. One can imagine very many ways in which nineteenth-century Renaissance windows might be designed, inspired altogether by the work of the fifteenth and sixteenth centuries, and yet in no wise following the lines of the glass-painters of that period, who were more or less off the track of glass-painting,—what they might have done had they known or cared more about glass, but what they certainly did not do.

There, if we seek an ideal, is one worthy of the best of us.

The Chairman (Mr. C. R. Pink, President) in opening the discussion, having referred to the decay of ornamental art, said Mr. Day had several times mentioned the mosaic treatment of glass *versus* painted glass, and there was a great deal to be learned on that point, leading up as it did to the importance of lead outlines in stained glass. With old painted glass, much of the admiration which it evoked was due to the texture and quality of the ancient material. Until lately it was impossible to obtain any with the old texture and quality. In Winchester College Chapel could be seen a fine series of windows, but although, in general design, excellent fac-similes of the antique work, the result was disappointing, and was attributable, he believed, to the want of

colour and texture in the glass. Now-a-days, however, it was possible to obtain glass of the old texture, and he might instance an excellent example, "shining with shapen shields," which was exhibited at the Health Exhibition, in the small Guildhall of Old London. Mr. Day had given wise advice as to the course of study to be pursued by the decorative artist in stained glass. He had insisted on the importance of cinquecento glass, and had dwelt upon the beautiful windows in St. Gudule, at Brussels, perhaps amongst the finest in Europe. The lecturer had also maintained that much might be learned from decorative art of every kind and date, though that of the sixteenth century was the best on which to base one's work. A great deal had been already done by Mr. Day and others to show that a new departure was possible. As an instance of this he might mention the magnificent St. Cecilia window by Mr. Burne Jones in Christ Church, Oxford, which showed good colour and drawing, with modern feeling, and yet with just the amount of conventionalism required in stained glass. Those who took part in last year's Excursion would also recollect some of Mr. Burne Jones's works at Middleton Cheney, which also showed the possibilities of new departures, though on old lines so far as sound and good.

Mr. William White, F.S.A., proposed a vote of thanks to Mr. Day for his interesting and exhaustive lecture. Mr. Day showed that he had applied his thought to all the details and principles, and the many paradoxes he had laid before them. These paradoxes struck one with great force when the defects and beauties combined in the same windows of the various periods were pointed out. The great leading feature Mr. Day had brought before them was that the exaggeration of fine-art painting in a window was wholly and entirely misapplied. The chief object of stained glass was to give grand effects of colour, but not in the style of fine-art painting, where one studied the picture, rather than enjoyed the satisfaction which good colour imparted. As shown by Mr. Day, he believed there was a large field open for the rising generation, and he hoped that those who took up the work would carry it out upon the lines which had been laid down that evening. It might not be so remunerative as some branches of art, but any one who thoroughly succeeded in painted glass would never find lack of employment so long as there was any feeling of admiration for art.

Mr. Leonard Stokes seconded the vote of thanks, adding that he was a little confused as to Mr. Day's remarks regarding the styles of glass. Most architects followed pretty closely the lines of the old work in the buildings they executed, and should not the same course be pursued in regard to the glass? Mr. Day, however, seemed to think that any style of glass would do in any type of building. He agreed with the lecturer that brilliancy, depth of colour, and translucency were most desirable in glass; the modern stuff was often dull and insipid, but if more white glass was used beautiful silvery effects would be produced, very suitable for our town churches. He had observed that when the sun shone through modern glass it cast its colours on the pavement, whereas the old glass gave no colour. This could be seen very clearly in the Chapter House at York, where all the windows but one were old. When the sun shone through the old windows it simply produced a white or general patch, whereas the new one threw a distinct colouring on the pavement.

Mr. White remarked that in inspecting a Kentish church some twenty-five years ago, he found some antique glass which cast a distinct pattern upon the pavement, although there was none of the colour of the glass itself, but merely a sort of neutral and almost complementary tint.

Mr. A. C. Bulmer Booth understood that the leading-up was the chief element in the labour. He remembered seeing two windows brought from Cairo by Sir Frederick Leighton, which were badly damaged in transit. The design of these windows was of a floral nature, the glass being made up in plaster. The windows were reproduced, and proved very charming, but the main point about them was that the greater portion was plaster, with but a small proportion of glass.

Mr. Stokes inquired whether Mr. Day objected to the use of enamel? He had seen very excellent effects produced in modern glass by its use.

Mr. G. H. Blagrove dealt with the cost of leading. A few years ago he perpetrated some designs in stained glass with patterns burnt in for domestic work, and he was desired to use as little leading as possible, because the proprietor of the house considered that it obstructed the light. He, therefore, had to make his designs in as large pieces as he could manage. In the end the cost was greatly enhanced from the risk incurred in firing the large pieces, so that it far outweighed the labour of leading.

Mr. Hampden W. Pratt remarked that Mr. Day, who was a worker in this as well as in other fields of decoration, had always treated things in a broad light. His desire had been that they should get out of the old grooves, and that as they advanced in decorative matters they might draw lessons from the past, taking advantage of the better means at their disposal to reproduce the old effects. In the last few years there had been a departure from the early archaic character of art, especially in church work. Mr. Day had shown that they could get what was appropriate without having recourse to archaic and crude forms in figure-work.

The vote of thanks was then put, and carried by acclamation.

Mr. Day replied, and added that, although he could not pretend to speak precisely as to the question of cost, he could say that if one had money to spend, it would go a long way in glazing. Common painting was as cheap as glazing, and nasty into the bargain; but elaborately glazed work might be done for a sum inconsiderable in the decoration of a church. As to the styles, he must not be supposed to mean that any style of window would do in any style of church. Personally he would confess that style did not trouble him much, and the architect would sometimes please him better if he bothered himself less about it; but that was his own affair. Suppose they set themselves the task of doing as the old fellows would have done! Did they affect any style? Not a bit of it. If they were fourteenth-century men, adding to thirteenth-century churches, they did not attempt to do thirteenth-century work. They took care, however, as every artist naturally would, that what they did should harmonise with the general character of the work added to. With regard to the whiteness of the light coming through, he had wondered whether it was in any way due to refraction as it passed through the old glass, which was riddled with holes and decayed like an oyster-shell. Indeed, old glass was like old wine, a great deal better the longer it was kept. As to the Eastern windows, the Arabs simply pierced small holes in the plaster, and filled in the glass, but, so far as his experience went, it was crude in colour. It was helped by the depth of the setting, but the material was faint and poor. Of course, something could be done with enamelling, but it was so dangerous that he thought it better not to recognise it. The root of all evil was the shirking of the lead lines, and the chances were that any man who coquetted with enamel was on his way to the bad.

THE SURVEYORS' INSTITUTION.

PRELIMINARY EXAMINATION 1886.

OF the candidates who presented themselves at the Preliminary Examination of the Institution, held on the 19th and 20th instant, the following satisfied the Examiners:—

Bagot, H. F.	Eagland, W. F.	Michelmore, H.
Ball, J. B.	Elton, C. W. S.	Oakley, J. H.
Bateman, A. C.	Grimes, R. F.	Saunders, C. H.
Belcher, E. J.	Grover, A.	*Stainton, F. C.
Booth, G. W.	Haslam, D., jun.	Tilly, H. D.
Bowker, H. W.	Harding, F. A.	Tyler, J. W.
Brady, R. H.	Hawker, C. J.	Watney, D.
Bridgford, L. A.	Jessett, C. E. V.	Watson, R.
Cambridge, W. J.	Lynam, W. V.	Wheeler, C. T. O.
Chapman, G. H.	Martin, H. G.	Wilson, W. E.
Collins, A. C.	Melrose, F.	Wordley, A. G.
Davey, H. T.		

Lambeth.—A handsome brass eagle lectern has just been presented to the Parish Church of St. John, Waterloo-road. It is of Classic design, with richly foliated capital, and chased and engraved pedestal. The bird stands on a ball. The work was carried out by Messrs. Jones & Willis, of London and Birmingham, under the direction of the architect, Mr. Chas. Henman.

* Passed at head of list.

THE REGISTRATION OF PLUMBERS.

A MEETING of the plumbing trade of London, convened by the Court of the Plumbers' Company, was held on Monday afternoon in the Sewers Court at the Guildhall. Mr. George Shaw, the Master of the Plumbers' Company, occupied the chair, there being a large attendance of masters and journeymen.

Mr. W. R. A. Coles (hon. Secretary to the Congress of Plumbers) read the resolutions of the General Council formed to give practical effect to the resolutions of the Conference of Metropolitan and Provincial Plumbers, held on the 31st of July last, with a view to secure greater efficiency of plumbing and draining work in connexion with dwelling-houses. These were published with the report of the Conference given in the *Builder* for August 8 last, p. 185.

The Chairman congratulated the meeting on having assembled to discuss a subject which was so interesting to all of them, and another step in the movement which commenced in October, 1884.* At the previous conference all the chief questions affecting the efficiency of the plumbing trade, and the causes of and remedies for its defects, were discussed. Those meetings were representative of the whole United Kingdom, so that there was a general discussion and expression of opinion before anything was decided upon. The matter had been repeatedly and carefully considered by the Plumbers' Company, and a Council had been elected consisting not only of representatives of the plumbing trade, but of gentlemen associated in sanitary matters, architects, engineers, builders, medical officers, and others. They had felt the necessity of having as many sides of the question represented as possible, and this was the more necessary as the plumbers' craft held very much the same relation to the general trades as the medical profession held to the other professions. Any work unskilfully performed by doctors or plumbers brought in its train evils which they all wished to see lessened, and it was the desire of all plumbers that bad plumbing should cease to exist. They had no merely personal or special trade objects to serve, because that which would be of advantage to the plumbers themselves would also be of advantage to the public. The General Council included also masters and journeymen, and representatives of both Houses of Parliament, as well as the Director of the City and Guilds of London Institute for the Advancement of Technical Education, to which body they must look for help in spreading the benefits of that class of knowledge. With such a Council it was reasonable to look forward to a general uplifting of the plumbers' craft, to the common benefit of its members and of the community at large. The proposed scheme of registration embraced London and seven miles round, but this was not intended to be the limit of its operations, which they hoped eventually to extend throughout the whole length and breadth of the country. An important matter to be decided would be the form of examination to accompany the registration, and which was necessary for securing men qualified to carry out any class of work in connexion with the craft. At present, it was open to any man to undertake the duties of a plumber without giving sufficient evidence of qualification, and that was a state of things not tolerated in any other profession or trade involving the security of the life and health of the public. The Chairman concluded by moving:—

"That the Plumbers' Company open a Register for Plumbers (Masters and Journeymen) on the basis of the resolutions of the General Council."

Mr. Lammas thought there should be a central institution in London, with branches all over the country.

Mr. Webb approved of the principle of registration.

Mr. Soper said he lived in a district in which the New River Company had lately enforced their requirements in connexion with a constant supply. This had led to the removal of a good deal of old work, much of which was of a grossly incompetent character, and this showed the necessity for plumbers being registered.

Mr. Titmas was in favour of registration, not only for the protection of the public, but also for the advantage of the workmen themselves. If the tradesmen were registered, it would put an end to the employment of men who called

* See *Builder*, Oct. 4, 1884, p. 472; and Oct. 25, 1884, p. 553.

themselves practical workmen, but who often were not plumbers at all.

Mr. Johnston agreed that there were a lot of "messers" about, though a great many good workmen were to be found. Unfortunately, builders were often satisfied with "low-money" men. He was in favour of registration.

Mr. Lyne, representing the Kensington, Notting-hill, and Chelsea Plumbers' Society, wished to know what sort of examination was proposed? The majority of journeymen plumbers had been educated at the national schools, before the passing of the Compulsory Education Act. Would the examination be both practical and theoretical?

The Chairman replied that it was not desired to have an over-scientific examination. It should be mainly practical, at the same time including certain theories that had been too much lost sight of. It was not expected that men who had made their position, and who had all along been looked upon as good tradesmen, should be subjected to a scientific examination. They would rather look to such men for assistance and counsel in raising the craft to a higher level than it had hitherto reached.

Mr. Lyne complained that the hour of holding the meeting prevented a large number of journeymen from attending.

The Chairman remarked that it was impossible the whole of the trade could be present.

Mr. Lyne also complained of the shortness and want of publicity of the notice of meeting.

Mr. Coles said he had personally sent notices to every firm of plumbers that appeared in the Post-office Directory.

Mr. Firth added that all the Society men of London had received notice and were well represented.

Mr. Shelley (Kingston) said he was one of the sufferers by bad plumbing, and was greatly in favour of registration. He only wished the area could be extended to twelve miles.

Mr. Reekie wished to see all journeymen registered. There had been registration on a small scale, the New River Company having registered master plumbers. (Hisses, and a voice:—"That is a monopoly.") Plumbers had been compared to doctors, who had the authority of the law to help them, and unless the plumbing craft could invoke the same authority registration would not carry much weight with the public. The great difficulty would be the registration of masters.

The Chairman remarked that it was the object of the meeting to get a kind of leverage by which they might eventually secure a power like that now possessed by the medical profession.

The resolution was then agreed to unanimously.

The Chairman next moved,—

"That the names and addresses of Plumbers registered be published weekly during the months of March, April, and May, in the chief technical and daily newspapers, and periodically afterwards as the Plumbers' Company may decide."

It would be useless, he said, to have the names registered unless the public were able to refer to some list for properly-qualified plumbers. To do this certain expenses must be incurred, which should be met by those who had the advantage of being enrolled. When once an area was established it would be easy to extend the work throughout the length and breadth of the kingdom.

Mr. Gilbert inquired if a workman were compelled to do low-class work, under an unscrupulous master, might not his certificate be endorsed or even cancelled?

Mr. W. Scott Moncrieff, M.I.C.E., considered the last remark was of so much importance that Mr. Gilbert should submit it in writing to the next Council meeting. Such questions should be carefully considered by the Council, and the difficulties that arose dealt with.

Mr. Thomerson asked if it was intended to include master builders on the register? At the East End they suffered much from small jobbing builders who employed "tinkers."

The Chairman thought there could be no objection to include builders if they were also practical plumbers.

Mr. Lyne.—How many journeymen plumbers are on the Council at the present time?

The Chairman.—Something like eight or ten working-men, but there is no reason why you should not add to their number.

The second resolution was then agreed to.

The Chairman next moved:—

"That four masters and eight journeymen plumbers e chosen from this meeting to assist the General Council and the Plumbers' Company in preparing a form to be filled up by plumbers applying to be admitted to the Register."

Mr. Lyne asked for the names of the members of the Council.

The Chairman said it was not intended that the Council should be simply composed of plumbers; indeed, it would not be proper that it should be so. Unless there were men of all branches on the Council, they would never secure that public support which they had a right to look for. Plumbers must understand that a one-sided bargain seldom gave universal satisfaction. The Council comprised such names as Earl Fortescue, the Lord Mayor, Dr. Cameron, M.P., Mr. George Godwin, F.R.S., Mr. Ewan Christian (President of the Royal Institute of British Architects), Sir James McGarel Hogg, M.P., Mr. Penrose, Professor Corfield, Dr. Vacher, and Mr. Ernest Hart. These gentlemen had no personal object, but desired to assist in a movement which they believed to be a good one. They were in reality going out of their way somewhat to associate themselves with the scheme in order to make it a success; therefore, it should not be looked at merely from the plumbers' point of view.

Mr. Lyne said he did not object to the names the Chairman had given.

Mr. Webb suggested that delegates of the different societies might be elected hereafter.

Some discussion then ensued, in which Messrs. Reason, P. J. Davies, James Sanders (Newport, Mon.), and others took part, and twenty names were proposed. On being put to the vote, the following twelve gentlemen were elected, viz.,—Messrs. Titmas, Clegg, Sanders, and Hume (masters), and Messrs. Firth, Browning, Stevens, Cornwall, Gilbert, Lyne, G. Taylor, and Tarrant (journeymen).

The resolution, with the addition of these names, was agreed to.

The meeting then took into consideration the question of the fees to be payable for registration.

The Chairman remarked that they did not wish more than would cover expenses, but the fees should not be fixed so low as to give an idea that registration was not of some intrinsic value.

Mr. Clarke proposed that journeymen should pay 1*l*., in two instalments, 10s. on registration, and 10s. on receipt of certificate,—and that the masters should pay 5*l*.

Mr. Webb moved, as an amendment, that the masters pay two guineas, and the men 10s. 6d., with smaller annual payments to be determined by the General Council.

Mr. Weymouth moved that the masters pay one guinea and the journeymen 5s.

Mr. Simpson thought that it would be well to have only a registration fee, as an annual subscription would entail the cost of collection.

The Chairman said it was essential to be in touch with those who held certificates, otherwise they might be misused.

Mr. Lyne considered that 5s. annually for the journeymen should be enough, and unless they derived some advantage it would be too much.

The Chairman said he was much surprised that the advantages of the movement should be valued at so low a figure. If the subscription were reduced to 5s. they would be intimating to the public that the movement was not much appreciated.

A Journeyman, speaking from the back of the room, said he did not think it would be right for the Plumbers' Company to enrich itself at the expense of the poor workmen!

The Chairman said he was utterly astonished at such a remark. Did not the last speaker know that the Plumbers' Company had spent hundreds of pounds in connexion with this movement?

On being put to the meeting, Mr. Webb's amendment was carried, and on being put as a substantive motion it was resolved,—

"That the fees payable for registration shall be 2*l*. 2s. for master plumbers, and 10s. 6d. for journeymen plumbers."

A vote of thanks to the Chairman closed the proceedings, which had lasted more than two hours.

Mr. S. Stevens Hellyer writes:—"I was at the meeting of the plumbing trade at Guildhall, held to consider the proposed scheme for registering plumbers, and I was prepared to speak upon its value, but finding that there was no lack of speakers to support the movement I was content to remain silent. I hear, however, that in some quarters it was considered my silence was due to a want of sympathy with the object of the meeting, and in order to remove any such misapprehension I beg to hand you herewith a speech I had prepared for delivery on the occasion, which you may think worth while to insert in your next issue." The MS. in question is as follows:—

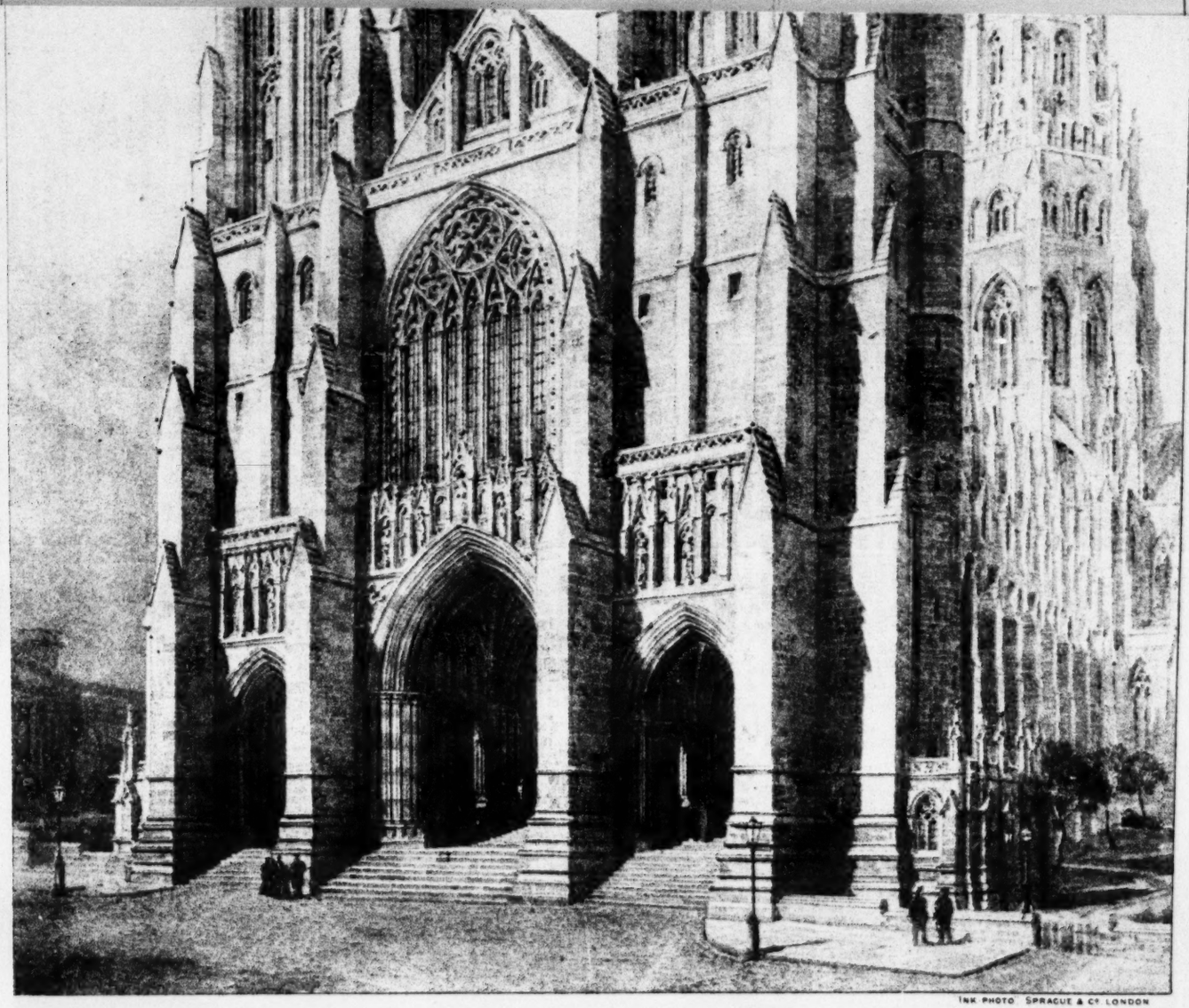
I confess that I have but little sympathy with class legislation, holding as I do the opinion that to give exclusive rights and privileges to any body or bodies of men, to the exclusion of others who may be equally, or even more entitled, is injurious to the true interests of the country. But this movement,—the registration of plumbers,—however advantageous it may become to the trade, is absolutely for the country's welfare,—is, in fact, for the good of all, except, perhaps, doctors and gravediggers; but the latter we need not trouble about, for in stopping their supplies, their own feet are kept out of the grave; and as for the doctors, they have shown, by the great interest they have taken in sanitary matters, that they are willing and generous enough to aid sanitarians and plumbers in making the homes of the people more healthy.

Notwithstanding all that has been said and done in the last eight or ten years to enlighten plumbers generally, and to arouse them to a proper sense of their duty, the trade, though much improved, still remains in a deplorable state, and it is high time that some strongly-constituted authority, like the one now being formed, should come forward in the name of the Law, and say to Ignorance, "So far shalt thou go, and no further"; should say to the men,—ignorant of the science of sanitary plumbing, and but bunglers in its art,—"We will no longer allow you, by your want of knowledge and by your inefficient workmanship, to endanger the health of the community, and bring discredit upon the trade." And I contend that there is no hardship in this, for "England expects every man to do his duty,"—the plumber as well as the sailor.

Before medical men are allowed to practise upon human life, they have to be duly qualified, and it is only right and proper that plumbers, upon whom the health of the community so much depends, should be equally compelled by law to fully qualify themselves for their duties. The time is now ripe for legislation, and the great hand of the law must be brought to bear upon the men who, dead alike to their own true interests and to the needs of the times, execute works under the name of plumbing which ought to shame even tinkers in the trade. The craft, Phœnix-like, must arise from its dead past and take up its true position, and that is "second to none" in the building trades. So important is this trade, that the health and happiness of our homes are largely dependent upon its workers. We speak of the "ills of life," but let us complete the sentence and say, "the ills of life are greatly added to by bad plumbing and bad drainage."

The great hindrance to the growth of sanitary plumbing knowledge is the *general* plumber,—the man all over the country who professes the knowledge of many trades. As the dancing girl, who has to represent the dances of many nations, withdraws from the public gaze for a moment to change her costume, to instantly reappear in another character, so these men have but to go into their shops to change their aprons and a tool or two, to come out again, now as a painter, and then as a glazier; now as a bell-hanger, and then as a gasfitter; and, last of all, as a plumber. Such men,—but tinkers in the old system of plumbing,—know little and care less about the new system. Ensconced behind a twenty or thirty years' practice of "How *not* to do it," they are not tractable to the new method of "How to do it." But the movement must advance, and any impediment in the way must be removed, as George Stephenson's railway-engine would have removed the "coo." Some may say, to this elbowing of the inefficient plumber, "It's all very well: but though these men are utterly incompetent to execute sanitary plumbing, they have rights and interests, and must live." Well, I would rather help than injure them, but others have rights and interests, and equally want to live. And all that is now asked is, that such men, wherever they may be found, shall no longer remain content with themselves,—content with their "rule-of-thumb" knowledge,—but shall educate themselves up to the requirements of the age,—shall, in fact, qualify themselves for their duties. And we say that no man who is deficient either in skill in his craft or in the principles on which his work should be done, shall be allowed any longer to write the name of "Sanitary Plumber" on his signboard to mislead the public.

In order to encourage men, and to embrace as large a number as possible in this movement for the registration of plumbers, I would make the portal to its outer court very wide. I would allow any man in the United Kingdom, upon satisfactory proof of his skill in the trade, to become in some way associated with this registration, *the ability to do the work being the first great requisite of the journeyman.* But when a man, in addition to the ability to do the work, can give intelligent reasons for what he does,—when, in addition to the knowledge of its art, he possesses a fair knowledge of its science, he ought to take a higher grade, to be allowed, as proposed, to use the letters "R.P.",—registered plumber,—at the end of his name, and this might be considered



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LIVERPOOL CATHEDRAL COMPETITION.—Design by Messrs. G. F. Bodley, A.R.A., and T. Garner.

View of West Front.

as the middle court. Then, in order to stimulate the men in the lower grades to larger and fuller studies, and, to elevate the trade generally, there should be a higher grade still,—an inner court,—for the men who, in addition to the knowledge requisite to gain admission to the lower or middle courts, possessed a more complete knowledge of the science of sanitary plumbing; men who can plan and direct the plumbing and draining work of a house in accordance with the principles laid down by the best authorities. And this grade might be distinguished by its members being allowed to use the letters "R.S.P." — registered sanitary plumber. The elevation of the trade to its rightful position is a noble work, worthy the best energies of its best men, worthy the resources of the Plumbers' Company; and every true well-wisher of the craft must wish Mr. Shaw success in his endeavours to establish a system of registration. We may not all see alike on many points, but I think we must *all* be agreed that the trade wants lifting up, and as registration is to be the lever let each one bring his weight to bear upon it; and then, with such a unity of purpose, it will not be long before the trade is lifted out of its present distrust and ignorance, and made to stand in a position of trust, dignity, and power.

A meeting of the General Council was held on Wednesday afternoon in the Library Committee-room, Guildhall, the Lord Mayor in the chair, when a report embodying the resolutions of the foregoing meeting was presented, and it was resolved that the twelve members nominated by the meeting of the plumbing trade be added to the Council, together with a number of other gentlemen. After considerable discussion, the following resolutions were also agreed to, viz.:—

"That the form to be filled up by plumbers applying to be admitted to the Register be settled by the Court of the Plumbers' Company, assisted by three members of the General Council and the members nominated by the plumbing trade of London.*

That the General Council defer fixing the amount of the annual payment to be made by plumbers admitted to the Register until further information is obtained as to the expenses which the system will involve.

That the registration, in the provinces, of plumbers, and the organisation of Provincial Boards of Examiners of Plumbing Work, be deferred for future consideration, pending the opening of the system in the London district; but that the extension of the system to the provinces be not long delayed; and that provincial plumbers be allowed to register in London pending the formation of provincial boards for registration.

That the General Council consider 'the means of increasing the number and efficiency of classes of practical instruction for plumbers throughout the kingdom.'"

Another resolution was passed, affirming the desirability of promoting legislation with the view of securing a more efficient examination of plumbers' work in new buildings, and leaving it in the hands of the Council to take such steps in that direction as they might deem advisable.

* The three members of the Council elected were Mr. Philip Magnus, Mr. Hardcastle, and Mr. Francis Chambers.

ARCHITECTURAL SOCIETIES.

Manchester Architectural Association. — At the meeting of this society on the 19th inst., Mr. J. Murgatroyd, Past-President of the Association, addressed the members on the subject of "Fifteenth and Sixteenth Century Architecture in the Valley of the Loire." The address was illustrated by numerous photographs, some of them of large size, showing most beautiful and interesting architectural detail, carving, &c., and also by a few pen-and-ink sketches made on the spot by Mr. Murgatroyd. By means of a map of France to a scale of 30 miles to an inch he pointed out the physical features of this portion of that country, and then rapidly sketched the historical facts connected with England's former close relationship with France, and particularly with Touraine, and described to his audience his route from Paris through Chartres, Le Mans, Tours, Saumur, Chinon, Azay le Rideau, Amboise, Chenonceaux, Blois, Chambord, and the return through Orleans.

Edinburgh Architectural Association.—At the fortnightly meeting of this Association, held on the 21st inst., Mr. G. Washington Browne, President, in the chair, Professor Baldwin Brown read a paper on "Sir Christopher Wren," in the course of which he dwelt on the importance of the work of Wren to the modern student. The Mediæval revival had passed, and Wren's churches could now be estimated without prejudice. They had now come to see that there is no salvation in special styles, that all styles were good when used with a right sense of their fitness for the purpose in hand, and that beyond and above all questions of this style or that there were the great universal truths of art, to which, if their work conformed, it mattered comparatively little in what particular style it was planned. Wren's work was modern, and was done under modern conditions. His buildings had little to aid them in the way of beauty of material or ornament, in associations or surroundings. He worked without the aid of a tradition of style, and without artistically-trained subordinates. His success was due to his own native genius, his sense of grace and of proportion, and his direct, simple, business-like method of work. His life had for modern architects both encouragement and warning,—encouragement, because he did great things under the unpromising conditions which were much the same in their own time as in his; warning, because it was impossible to follow in Wren's footsteps without something of the true artistic spirit of the master.

Dundee Institute of Architecture.—At the meeting of the Dundee Institute of Architecture, Science, and Art held on the 21st inst., Mr. W. Stephenson gave a lecture on "Ancient Egypt and its Monuments." Mr. Jas. Maclaren, President of the Institute, was in the chair.

OBITUARY.

Mr. Henry Masters.—The death is announced of Mr. Henry Masters, architect and surveyor, Bristol, who died at his residence, Meridian-place, Clifton, somewhat suddenly, on the 19th inst., in the 65th year of his age. Mr. Masters devoted a great deal of attention to sanitary subjects.

Mr. David Fraser, the senior partner in the firm of Messrs. J. Fraser & Son, granite merchants and polishers, Aberdeen, died at his residence, Broadford House, Aberdeen, on Sunday last, from a fit of apoplexy. The funeral took place on Thursday, at St. Peter's Cemetery, Aberdeen, being attended by at least 300 of the leading inhabitants and those in the granite trade.

NATIONAL ASSOCIATION OF MASTER BUILDERS OF GREAT BRITAIN.

THE sixteenth half-yearly meeting of the National Association of Master Builders of Great Britain was held on Tuesday, the 26th instant, at the Bell Hotel, Derby, the President, Mr. W. H. Cowlin, in the chair. The report and balance-sheet were read and adopted, the retiring officers being all re-elected.

The report shows that sixty local associations are in connexion with this Association, and that the state of trade throughout the country is in a very depressed condition, intimations of a reduction in wages in several districts being reported.

The meeting was largely attended, representatives being present from London, Liverpool, Manchester, Birmingham, Hull, and other large centres.

In the evening the Derby builders entertained the Council and other friends at dinner, the chair being taken by Mr. Walker, the President of the Derby Builders' Association, who was supported by the Mayor of Derby.

On the following day a large party were, by the kindness of the managers, escorted over the wagon and locomotive works of the Midland Railway Company by Mr. Walker, where a most instructive day was spent.

COMPETITIONS.

Proposed Town-hall, Motherwell, N.B.—At a meeting of the Commissioners on Monday last, a design for the proposed new town-hall, burgh offices, &c., was decided upon. Fourteen architects had been invited to compete, four of whose designs had been laid aside as exceeding the stipulated cost, leaving ten under consideration. The first premium was awarded to Mr. John B. Wilson, A.R.I.B.A., of Bath-street, Glasgow, and it was agreed to adopt his design and instruct him to proceed with the work at once. The second premium of 25*l.* was awarded to Mr. H. B. Steel, of Glasgow; and the third of 10*l.* to Messrs. Wilson & Stewart, also of Glasgow. The adopted design provides a town-hall seated for over 1,200 persons, lesser hall, and court-room, Burgh Engineer's and Town Clerk's offices, two public offices, committee-rooms, &c., fire-engine store, caretaker's house, &c., the estimated cost being about 6,000*l.*

Proposed Municipal Buildings at Christchurch, New Zealand.—At a special meeting of the Christchurch City Council, held on the 6th ult., the design of Mr. S. Hurst Seager, A.R.I.B.A., was selected from amongst those of other competitors for the contemplated Municipal Buildings. Mr. Seager proposes to use terra-cotta very largely in the exterior of the building.

Proposed Baptist Chapel, Egremont, Cheshire. The building committee of the Falkland-road Baptist Church in October last invited four selected architects to submit plans in competition for the proposed new chapel, schools, &c., to be erected on the site at the corner of Falkland-road and Brighton-street. On the 8th of December four sets of plans were received. The committee, who were assisted in technical points by Mr. Wm. Parslow, F.R.I.B.A., having carefully examined the designs, decided to award the first place to those bearing the motto "Fides," the author of which proved to be Mr. James S. A. Mercer (Messrs. F. & G. Holme), Westminster-chambers, Liverpool.

ELECTION OF A DISTRICT SURVEYOR.

AT the meeting of the Metropolitan Board of Works, on the 22nd inst., the first business proceeded with after the confirmation of the minutes of the previous meeting was the election of a District Surveyor for the Western Division of the City of London, in the room of Mr. Rawlinson Parkinson, deceased. There were thirty candidates, who were reduced by show of hands to six, viz., Mr. S. F. Clarkson, 23 votes; Mr. W. J. Hardcastle, 29 votes; Mr. H. McLachlan, 33 votes; Mr. M. L. Saunders, 34 votes; Mr. W. L. Spiers, 29 votes; and Mr. H. W. Stock, 32 votes.

A proposal to vote by ballot on these selected candidates was lost. The voting, therefore, proceeded in the usual way, with the following results:—

	Second Vote.	Third Vote.	Fourth Vote.	Fifth Vote.	Final Vote.
Clarkson, S. F.	23	19*	26	19	14
Hardcastle, W. J.	24	21	22	15	—
McLachlan, H.	30	31	31	31	32
Saunders, M. L.	20	20	18	—	—
Spiers, W. L.	19	—	—	—	—
Stock, H. W.	23	19*	—	—	—

Mr. McLachlan was therefore declared to be duly elected, and he tendered his thanks to the Board.

Illustrations.

LIVERPOOL CATHEDRAL.

DESIGN BY MESSRS. BODLEY AND GARNER.

THIS week our lithographic illustrations are all devoted to Messrs. Bodley & Garner's design for the proposed Cathedral at Liverpool. They include external views from the north-west and west, and the east and south elevations. In addition we give a plan. For explanatory article, see p. 190 of this number.

The Forth Bridge.—A testimonial in the form of a handsome gold watch was, on the 21st inst., presented to Mr. P. W. Meik, resident engineer, who has during the last three years represented Sir John Fowler and Mr. Baker at the Forth Bridge Works, this period being the whole time that has been occupied in the construction of the foundations. The presentation took place in the presence of most of the subscribers, including Mr. Arrol and Mr. Phillips, partners in the firm of Tancred, Arrol, & Co. (contractors for the bridge). Mr. A. Symonds, chief inspector of the works, was deputed to present the watch to Mr. Meik on behalf of the subscribers, and spoke warmly of the regret which they all felt at the termination of his professional connection with the Forth Bridge Works, and hoped that in his future professional career he would meet with great success, and always feel as comfortable about the soundness of the work as he now could about the foundations of the Forth Bridge. Mr. Carey spoke on behalf of the engineer's staff, Mr. Arrol on behalf of the contractors, Mr. Middleton for the contractor's staff, and Mr. Gray on behalf of the foremen, the latter presenting Mr. Meik with a handsome paper weight made from a piece of the foundation rock of the Inch Garvie pier. Mr. Meik, in responding, said he had never been on an undertaking where there had been more pleasant relations between those employed than on the Forth Bridge.

* There being a tie here, these two names were again voted upon in order to decide which of the two should be retained for further voting. This vote was as follows:—Clarkson, 21; Stock, 16. Mr. Clarkson's name was therefore retained.

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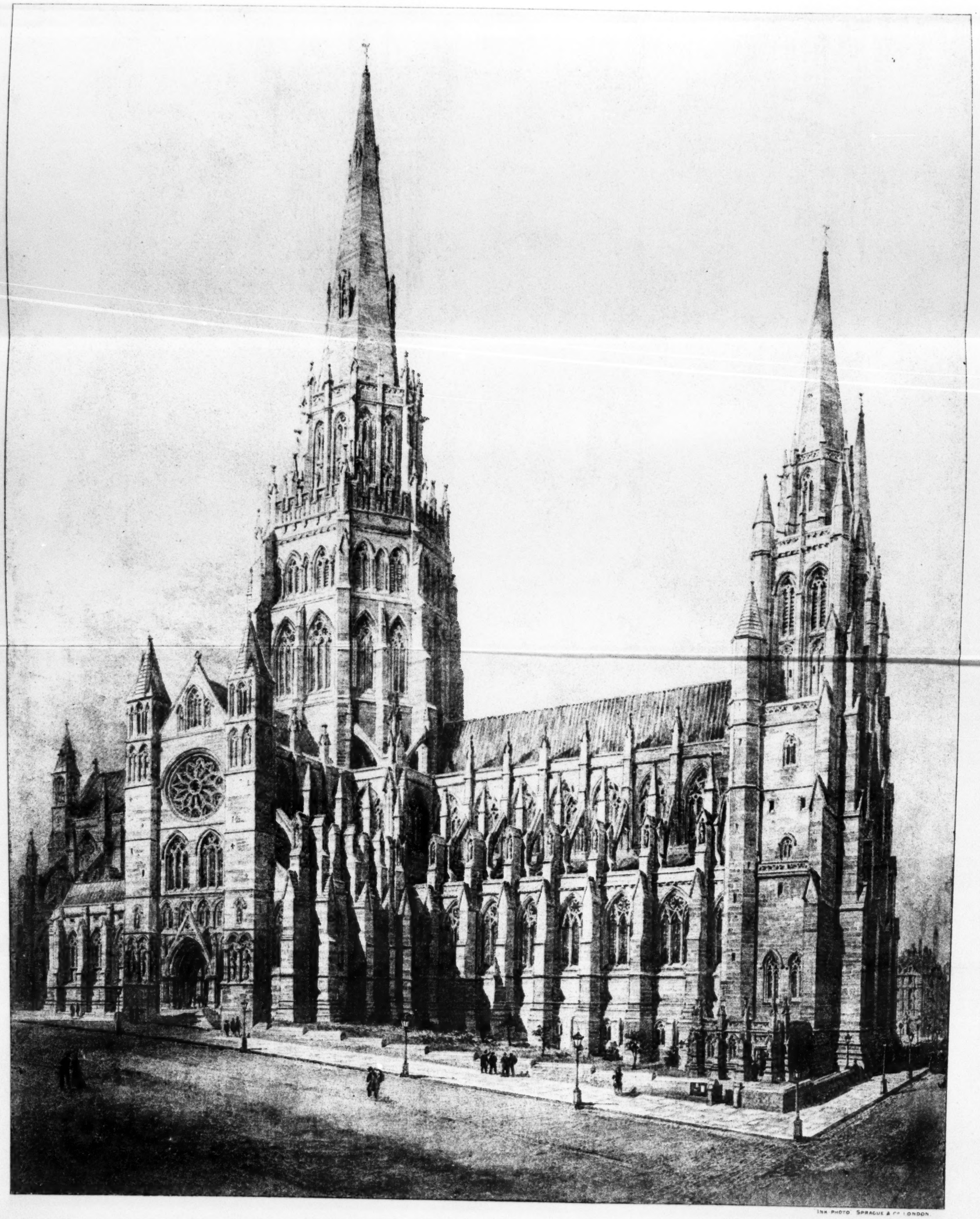
LIVERPOOL CATHEDRAL COMPETITION.—Design by Messrs. G. F. Bodley, A.R.A., and T. Garner.

View of West Front.



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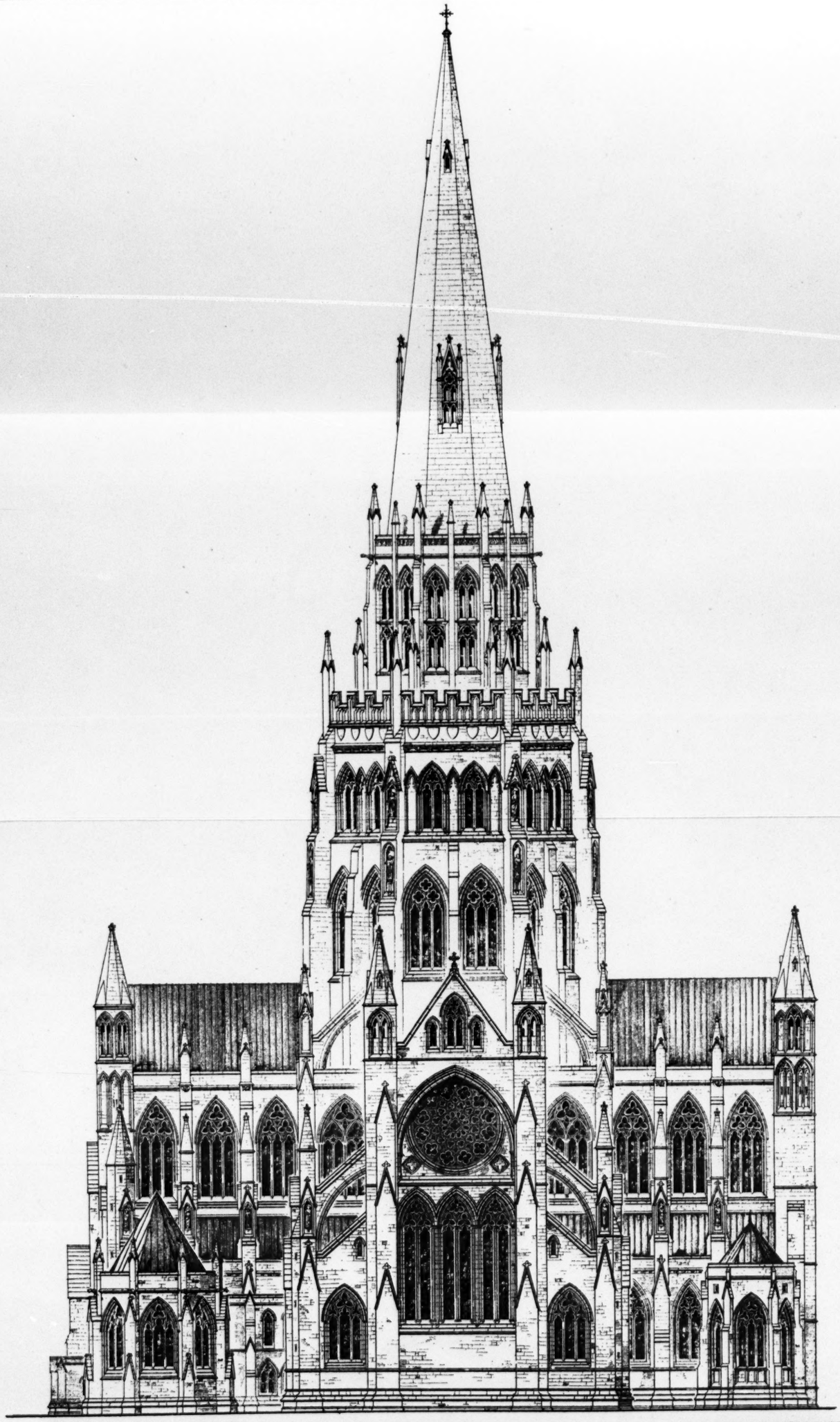
LIVERPOOL CATHEDRAL COMPETITION.—Design by Messrs. G. F. Bodley, A.R.A., and T. Garner.

View from North West.

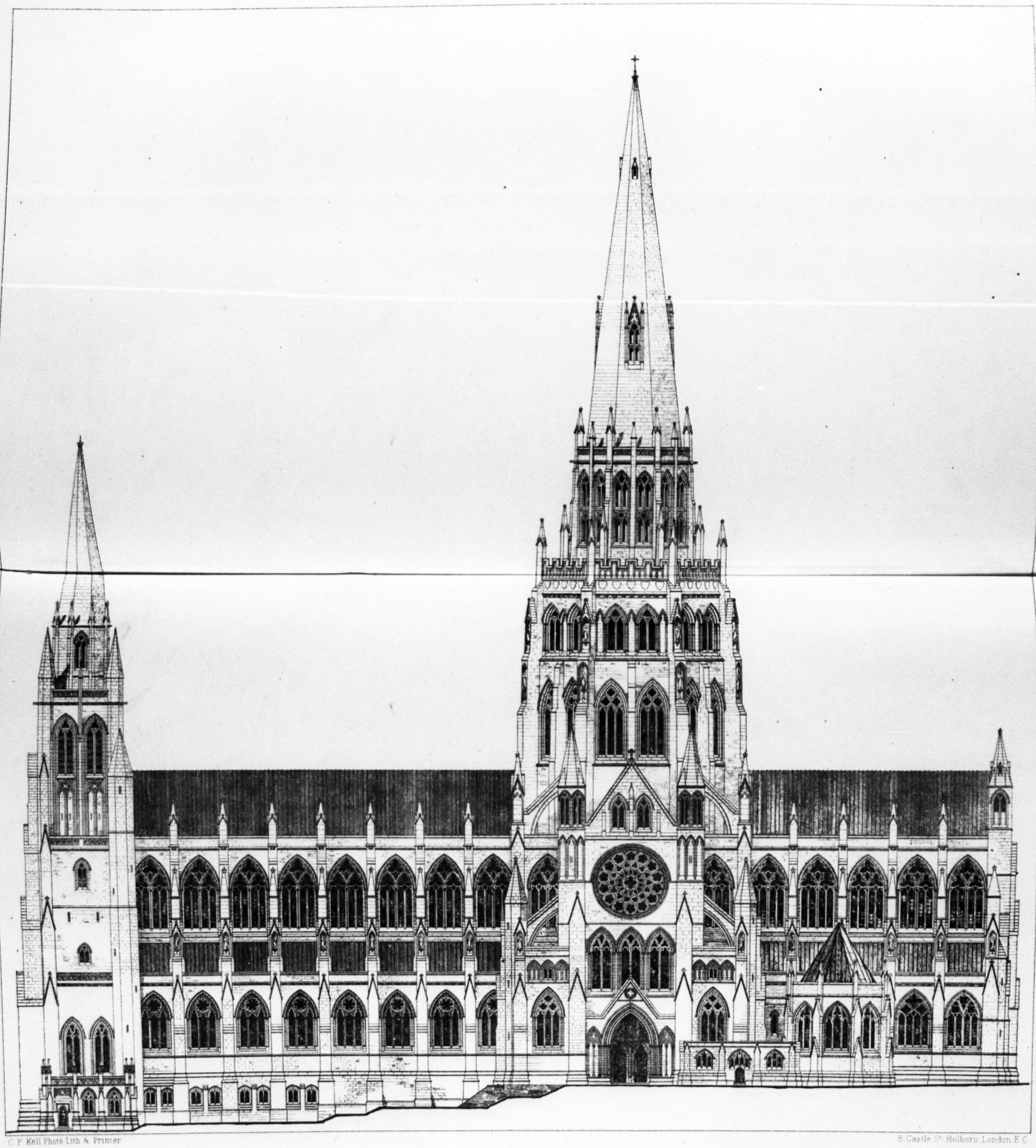


C.F. Kell Photo-Lith. & Printer. 8, Castle St Holborn. London. E.C.

LIVERPOOL CATHEDRAL COMPETITION.

DESIGN BY MESSRS. G. F. BODLEY, A.R.A., AND T. GARNER.

EAST ELEVATION.



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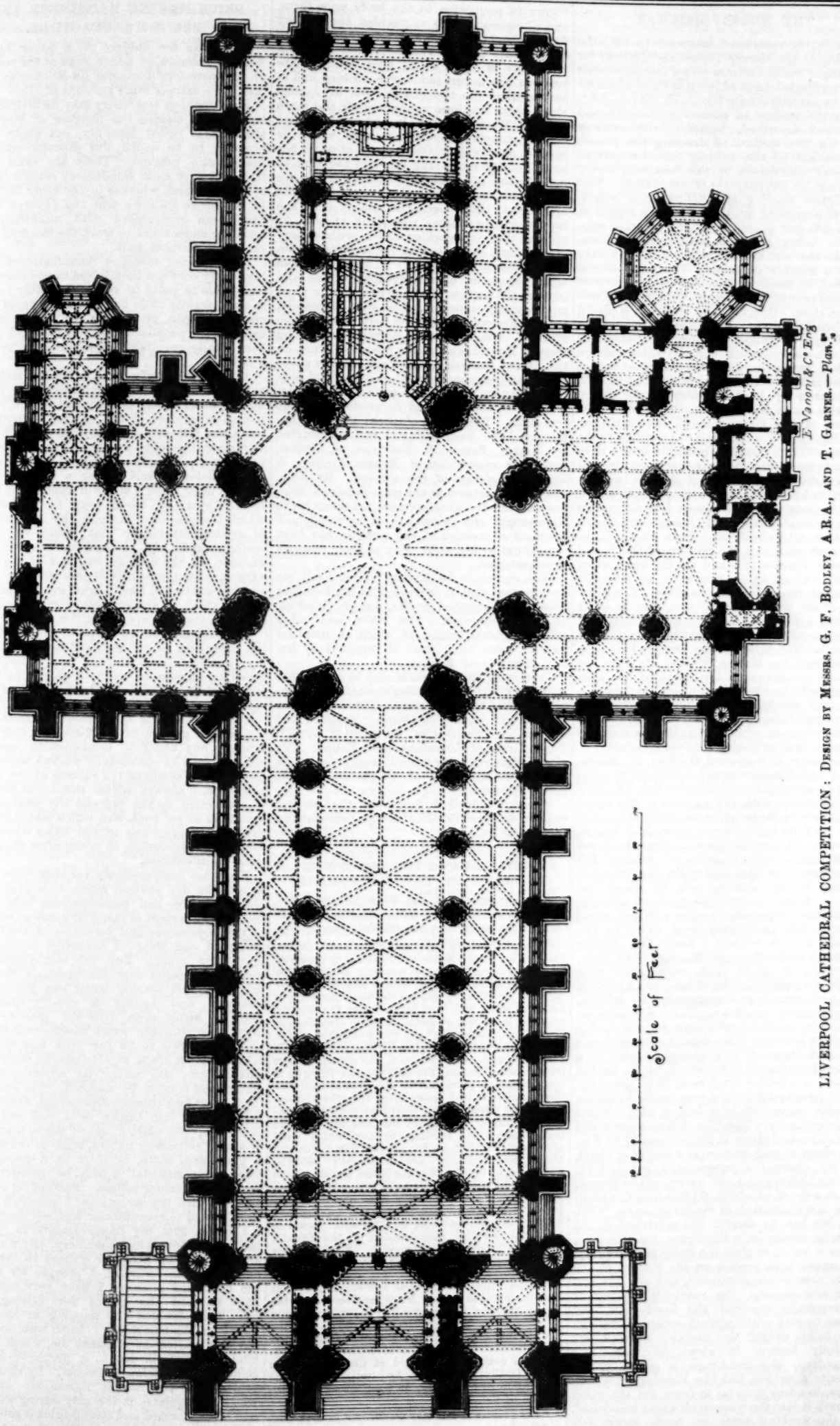
LIVERPOOL CATHEDRAL COMPETITION.

DESIGN BY MESSRS. G. F. BODLEY, A.R.A., AND T. GARNER.

SOUTH ELEVATION.



LIVERPOOL CATHEDRAL COMPETITION: DESIGN BY MESSRS. G. F. BODLEY, A.R.A., AND T. GARNER.—*Plan.*

THE MERSEY RAILWAY.

WE briefly mentioned last week (p. 187) the opening of the Mersey Tunnel and Railway for passenger traffic, and now give a few particulars of the undertaking in addition to those which we gave in our number for March 15, 1884 (p. 365), where the method of executing the work will be found described, together with sections showing the method of draining the tunnel. In addition to the railway tunnel a parallel driftway was driven by the Beaumont boring machine for the purposes of ventilation. This ventilation heading is 2,300 yards in length, and is connected with the railway tunnel in eight different places by means of cross cuts, which, being provided with suitable doors, enable the air to be conducted to the fans from a number of points. The ventilation is effected by means of four Guibal fans, two on the Birkenhead and two on the Liverpool side of the river. One, 30 ft. in diameter, is placed in Hamilton-street, Birkenhead, to ventilate the length of tunnel between the Central or Borough-road Station and Hamilton-square Station, and is throwing 186,000 cubic feet of air per minute. The fan at Shore-road is 40 ft. in diameter by 12 ft. in width on the blades, and this draws the air from the tunnel at the centre of the river through the ventilation heading up to the fan itself. According to the *Liverpool Daily Post*, the principle aimed at in the scheme of ventilation is that fresh air shall enter the stations, and travel inwards in either direction into the tunnel to the respective fans, thus keeping the platforms as free as possible from smoke. The fans at Liverpool are similar to those at Birkenhead. That of 30 ft. in diameter ventilates the portion of the tunnel between James-street and the Central Station, whilst that of 40 ft. draws its air from the tunnel at the centre of the river. The quantity of air thrown by all four fans is about 600,000 cubic feet per minute, so that the entire air of the tunnel is changed every seven minutes. The fans and fan engines have been constructed by Messrs. Walker Brothers, of Wigan. An ingenious improvement has been introduced into these fans, which consists of a A-shaped regulating "shutter," by which the air passes in a continuous current into the chimney instead of intermittently, as formerly the case, thus rendering the fans noiseless.

The deep underground stations at James-street and Hamilton-street (of which illustrations appeared in the *Builder* for Feb. 28, 1885) are connected with the stations at the street level above by large hydraulic lifts, which may in a way be looked upon as vertical branch railways. In each of these stations there are three lifts, each capable of raising 100 passengers at a time, and as the time occupied on the vertical journey will be about one minute, it will be possible when all arrangements are completed, to raise a heavy train-load of 300 passengers from below to the surface in one minute. Each lift consists of an ascending-room, 20 ft. long, 17 ft. wide, and 8 ft. to 10 ft. high, constructed with handsome panelled sides of teak and American ash, and lantern roof surrounded by mirrors, with a central gas lamp. There are seats on each side for those who care to rest during the short journey. This cage is supported on a very stiff frame of iron girders, riveted to a central forged steel cross, which, at its centre, is fitted to a hollow steel ram, 18 in. diameter, which rises and falls in a very strong hydraulic cylinder, suspended in a boring sunk beneath the tunnel level. The lifts at James-street rise 76 ft. 6 in. and those at Birkenhead 87 ft. 6 in. In a tower at each station, at a height of about, 120 ft. above the pavement, a supply-tank, holding 10,000 gallons of water, will be placed, and at a depth of about 60 ft. below the pavement is a waste-tank of similar capacity. When any lift has to ascend, the attendant in the cage, by means of a hand-rope near the door, opens a valve, so that the water pressure from the upper tank presses on the bottom of the 18 in. ram above mentioned, and the lift will then rise rapidly. On reaching the top, it automatically reverses the hand-rope, and comes to rest with perfect quietude, though the total weight in motion, when a lift is fully loaded, is about 28 tons. For descending, the hand-rope is pulled in the opposite direction, and the starting-valve then opens, to allow the ram to force out the water beneath it into the waste-tank above mentioned. All the working parts are made enormously strong in proportion to the loads upon them, and all connexions are so guarded that if any detail should fail there is something else to take up its duty. The hydraulic pumping machinery is fixed on a floor intermediate between the upper and lower booking-hall in each station. In the engine-room at James-street there are three marine boilers, and three pairs of Messrs. Easton & Anderson's patent duplex pumping-engines, each of which is capable of raising 30,000 gallons of water per hour from the waste-tank below to the supply-tank in the tower above. These engines are also so connected that they can supply the lifts direct, either acting in unison with the supply-tank, or without such tank at all. At present they are working direct without any supply tank, as the towers for receiving them are not yet completed. A very ingenious arrangement of interchangeable valves and pipes in the engine-room enables any main pipe, pumping-engine, or lift, to be shut off readily, without disturbing any other part of the whole system. The lifts were severely tested by General Hutchinson, of the Board of Trade, on the 29th of December, with loads equal to about 140 passengers concentrated on one side of each cage, and they stood these tests most satisfactorily, and ascended and descended with the test loads. The whole of these hydraulic appliances have been designed and constructed by Messrs. Easton & Anderson, of London, under the supervision of Messrs. Brunlees & Fox, the engineers of the railway. Mr. Rich, one of the partners in the manufacturers' firm, has devoted the greatest personal attention to the strength and security of every detail, and the work of erection at the stations has been carried out by Mr. C. R. May as their resident representative.

With regard to the Mersey Tunnel itself, we are informed that it is lined with Staffordshire blue bricks, supplied by Mr. Joseph Hamblet, of West Bromwich. The white and other coloured glazed bricks, of which an immense number were used, were all supplied by Mr. J. C. Edwards, of Ruabon.

Concerning the stations it may be added that all the booking-halls, waiting-rooms, &c., in connexion with the four stations have been laid with patent wood block-flooring, supplied and laid in his preservative composition by Mr. Roger Lowe, of Farnworth, near Bolton. The glass and zinc roofing has all been executed by Mr. T. W. Helliwell, of Brighouse, on his patent systems.

Messrs. Waddell & Son were the general contractors, Mr. Prentice being their resident representative.

NEW BY-LAWS FOR CONCRETE-BUILDING IN THE METROPOLIS.

AT the meeting of the Metropolitan Board of Works on the 22nd inst., the Building Act Committee brought up the following report:—

"Your Committee have had under consideration the question of the power of the Board to regulate, by new by-laws, the use of concrete in buildings. Your Committee reported, on the 2nd of October last, the decision of the magistrate, dismissing a summons which had been taken out by the District Surveyor in respect of certain artisans' dwellings in Zoar-street, Southwark,* and the Board then authorised the Solicitor to give the District Surveyor the necessary legal assistance upon the appeal. Upon further consideration, the Solicitor has thought it inexpedient to proceed with the appeal, and your Committee have had before them the general question of the power of the Board to deal with concrete buildings. The Board has jurisdiction in the matter under the existing by-laws, which were sanctioned in 1879, so far as the foundations of houses and buildings are concerned; but the Solicitor is of opinion that the Board has at present no power to make by-laws as to concrete buildings generally. Your Committee have therefore prepared, in conference with the officers, new by-laws relating to concrete walls, together with clauses as to the duties and remuneration of the District Surveyors in connexion therewith. Printed copies of the proposed by-laws have been forwarded to the members of the Board, and your Committee now submit them for approval, and recommend that they be approved by the Board, and be sent to the Home Secretary for confirmation; also, that a copy of such by-laws, together with notice of the Board's intention to apply for confirmation of the same, be advertised; and that copies of such by-laws and notice be delivered at the office of the Royal Institute of British Architects and of the Institution of Surveyors, as required by the 16th section of the Act."

* For a report of this case see *Builder*, Sept. 19, 1885, p. 408.—ED.

BRICK-MAKING MACHINERY AND BRICK MANUFACTURE.

THIS was the subject of a paper by Mr. William Johnson, of Leeds, read at the meeting of the Inventors' Institute on Monday evening last. We extract some portions of it:—

Brick-making machinery may be divided into two distinct classes, the pugging or plastic,—the what is called semi-dry, but ought more properly to be called dry process,—and the semi-plastic process. There are some clays that will give most satisfactory results by one of the processes, whereas in the other they will be an entire failure; and the failures which have been experienced with machinery are owing to endeavours to work the material by a process unsuitable to it.

Brick-making machine manufacturers have invariably confined themselves to one class, and being able to point to very satisfactory results, in their anxiety to do business have urged their speciality upon purchasers for whom, on account of the peculiarity of their material, it has been totally unsuitable, and has therefore been a failure.

As a brick-manufacturer by birth, I may say, and also having been connected with brick-making in its various branches all my life, I have had an experience of the varying character of clays, and the necessity there is for their having a treatment peculiar to themselves, having witnessed many failures and great losses. I never contemplated myself having a genius for invention until I had a series of continuous losses for the space of seven years in brickworks, which I commenced through the impossibility of getting machinery that would work the material profitably. I tried one machine after another, all the best known, and of the most expensive kind, but in each case with the same result,—continued loss. I tried every expedient I could think of, and eventually succeeded, and entirely overcame my difficulties.

I at once cleared the whole of my machinery out regardless of its cost, and replaced it with my own inventions, which, I need not say, has given me an ease of mind to which I had long been a stranger, and also turned my loss upon working into a handsome profit.

The Advantages of the Various Processes.—By the plastic system of brick-making, there are scarcely any kinds of brick-making material which cannot be successfully worked, and where there is any doubt of the success of the other processes, I always advise this. But the cost of production by the dry and the semi-plastic system is 40 per cent. less, which makes it very desirable to adopt one of the latter where the material is favourable, as profit, after all, is the great consideration.

There are comparatively very few clays suitable to the dry process, where it is desired to obtain a firm and non-absorbent brick, and indeed this process is fast dying out on account of the porousness and looseness of the bricks produced, and must of necessity decline yet more and more. But the semi-plastic has many advantages over the previous two, the bricks by this process being less porous and stronger, and having a greatly increased breaking strain even over the plastic-made brick, and with the extra recommendation of being produced at 40 per cent. less cost in labour. Most kinds of clay can be worked by this system, and where its advantages are understood it must be adopted. The material for it must be naturally dry enough to allow of being made into bricks in a stiff and firm condition; the clay, if out of shale, marl, and of a hard refractory nature, must be reduced to a granulated state, or if it be a strong and bituminous material it may be prepared by horizontal crushing rollers. Succeeding so well as I had with my inventions, I patented them and decided to manufacture and sell them.

I notice first my improvements in plastic brick and tile-making machinery. By a special arrangement of wings or cutters in the mill, and the mode by which I provide for taking the backward pressure, I have very considerably reduced the power for driving, and have fully doubled the pugging or kneading power of the machine. I have also acquired the sole control of a patent die, which in any kind of clay will insure a perfectly-formed column of clay being delivered. By these improvements the air is thoroughly expelled which accumulates in the clay during working, and a well-formed and strong brick is produced.

Semi-Plastic Machinery.—One of my patents

is for preparing the clay, and the two others have reference to making and pressing the bricks. In my system for semi-plastic brick-making two machines are used. In the view of two or three persons to whom I have represented these, it has seemed to them a needless complication and waste. My reply to this is, that, as a brick-maker, and having had an experience with all the best machinery in use, my experience has been that in combining the two processes of making and pressing in one machine too much has been attempted and not accomplished, and in ninety per cent. of the machines now at work combining these, a second machine has had to be added for finishing the bricks. It therefore appeared to me an entire and useless waste to complicate a machine which greatly added to the cost in wear and tear, and in working, in order to gain a result which the experience of years had proved to be practically impossible. By "impossible" I mean to produce the desired quality of bricks that would be commercially profitable. The great weight of material to be dealt with for a small result of value is a consideration of much importance. It is easy to make a picture, both on paper and in iron, but the vital question is the amount of profit it will yield; engineers will say that the combination of the two processes is possible in one machine. I allow this, but it will be got at the sacrifice of profit. Therefore, having these facts before me, I started out with the object of accomplishing the result desired by two processes instead of one, and designed a very simple arrangement of machine by which I could form a dense and square brick, which was then passed by the attendant boy within reach of a second machine, which took hold of it and delivered it finished in the best possible form. The brick-making machine is provided with a hopper, into which the ground clay is delivered. The bottom of this hopper constitutes a feed-box, one side of which is formed by a die cylinder, which rotates intermittently. By the action of this cylinder the clay is kept in continual agitation, and is prevented from sticking or clogging. Within the feed-box there works a reciprocating ram, which at each forward stroke forces a portion of clay into a die or mould in the cylinder. The action of filling one mould propels the previously formed brick out of the diametrically opposite mould of the cylinder, and delivers it on a table. The ram is worked from a crank, and is so arranged that its stroke can be regulated to give the exact pressure that is required, according to the nature of the clay under treatment. The crank shaft is driven by a spur wheel and pinion from the first motion shaft, upon which are the pulleys which receive the belt from the engine. The mould cylinder is rotated intermittently by an arm worked by a crank pin on the outside of the main spur wheel. The other end of the arm operates a kind of ratchet wheel, consisting of a pair of discs, between which it rests, and four studs or pegs. For each revolution of the crank shaft the cylinder is turned one-fourth of the revolution. When required by the special nature of the clay, the hopper and feeding-ram arrangements can be substituted by a pugging arrangement for feeding the mould. The brick-pressing and briquette machine mainly consists of a very solid powerful bearing standard, which supports a balance lever beam, which is alternately lifted and depressed by a connecting-rod from the crank-shaft. The short end of the lever works a ram die, which is kept vertical by travelling in a grooved bed on the face of the standard connected with the lever by a simple parallel motion gear. In this manner an enormous leverage with least friction is obtained. The ram comes down on a mould in the centre of a planed table; the pressed brick is then raised from the die by a plunger worked from a cam on the crank-shaft, and is then pushed forward by an arm which is operated by an eccentric on the same shaft. The pressure can be increased or reduced at will to suit all kinds of clay by an arrangement of detached plates being slid underneath the mould beds. The labour or attendants required are three boys to these machines, one to attend the hopper, keeping it full of the ground clay, one to pass the bricks to the second machine, and one to load the bricks as delivered out of the second machine on to the barrow or wagon to be taken direct to the kiln. By some slight alterations I adapt the pressing machine for making bricks by the dry process.

There has hitherto been a great prejudice against bricks made by machinery for fire-resisting purposes, on account of their being too close and compact; but I believe that with my improvements this objection is fully met,—that I can retain the openness or light compactness of the brick, which is thought to be necessary for resisting intense heat. Only recently a patent has been taken out for the manufacturing slate *débris* into bricks for building purposes, which promises to give considerable commercial value to an article that hitherto has only been an expensive encumbrance to the the slate-quarrying trade. This material makes up into a most dense brick, with a crushing strain of double the weight of one made from ordinary clay, and is, therefore, specially adapted for engineering purposes. The bricks, so far, have been made by the dry process, but it fails to bring out the advantages which this material gives for the purpose of brick-making. The patent semi-plastic machinery is specially calculated to meet this difficulty, and at the same time reduce the actual cost of their manufacture very considerably.

There is also an important manufacture which I believe is destined to expand and grow year by year. I refer to the manufacture of white and coloured glazed bricks; these have been made, so far, by hand-labour only. The reason assigned for this is that the quality requires to be so high, that it is impossible to obtain it other than by the most careful hand-work. I am satisfied that with the improvements I have introduced, this work can be done equally well, and at fully one-tenth of the cost of hand-labour in forming the brick.

Bricks enter so largely into our most important enterprises, those employed in their production are so large a community, and there is such a large amount of capital invested in their production, that I claim for bricks an interest equal, if not exceeding, that of many of the subjects which engage the attention of thoughtful men.

IS A TIMBER STAGE A BUILDING?

MESSRS. ALLEN & SONS, builders and contractors, of Palmerston-road, Kilburn, appeared before Mr. De Rutzen, at the Marylebone Police-court last week, on an adjourned summons taken out by Mr. Thos. Blashill, District Surveyor for Hampstead, for, in or about July, 1885, not enclosing a timber-stack with walls or brick or other incombustible material.

Mr. Blashill conducted his own case; and Mr. T. C. Earle defended.

Mr. Blashill said the defendant had erected a building of two stories in height for the stacking of timber. The erection was about 72 ft. by 32 ft., and had a number of posts fixed into the ground. The first-floor was of wooden joists, and the floor-boards properly tied. The cover or roof had on it zinc with rolls, and, in fact, had all the appearance of the roof of an ordinary building. The question was whether or not the structure was a building within the meaning of the Act? He contended that it was, because there was everything which would constitute a building, except that it had no walls.

In cross-examination, the complainant said it was true that he called the structure a timber-stack in his notice to the defendant, but he now called it a building.

The Magistrate asked, if all the timber was removed from the structure, would that which was left be a building?

To which Mr. Blashill replied that it was an ordinary place with ordinary roof.

Mr. Earle, in addressing the Magistrate on the case, submitted that there was no distinction between this case and other cases where it had been held that a timber-stack was not a building within the meaning of the Act, and that the matter of there being a roof did not affect the question at issue. He then cited the case of Harris *v.* Pinner, in deciding which Mr. Justice Chitty was reported to have said that "any ordinary person with a reasonable knowledge of the English language would not interpret the words in the Act to mean an erection known as a timber-stage." He contended that the Act should be interpreted in its largest sense, such as Mr. Justice Chitty had interpreted it. The Act did not give any definition of what was a building, and therefore he urged that the words of the Act should be understood in their ordinary sense, and, were that done, he was certain that no person would venture to call Messrs. Allen's timber-stack a building.

The Magistrate said he regarded the case as one of some importance to the public, and he would therefore hear Mr. Blashill again on the subject.

The complainant then said that he relied upon the wording of the Act, that a building must be enclosed by walls. The structure in question was, in every sense, a building, with floors and roof, and, in fact, complete in every way except that it was without walls. It was no ordinary skeleton structure. Referring to the zinc cover, he contended that it was similar in every respect to an ordinary roof with rolls and hips, and was not originally made for storing on, to which purpose it had latterly been turned to account.

Mr. Earle then called Mr. J. Allen, the defendant, who said he intended when putting the structure up to store hard woods, such as oak and mahogany, on the zinc roof. He had already put some up, and intended putting more there. The object of stacking timber was to dry it by the air having full play on it in a covered place, but were walls to be put up and the air kept out his (defendant's) object would be frustrated, and the stack would be useless. As to the floor being covered with boards, that was only done for the convenience of the workmen going round stacking the material, and to prevent their falling through the joists.

In giving his decision, Mr. De Rutzen remarked that he had once before given a decision on the subject of timber-stacks and although there was a difference between that and this case, still it helped him on the present occasion. Looking at the case before Mr. Justice Chitty, and having regard to the scope of the Building Act and the Prescription Act, he should hold that the erection in question was not a building, and the summons would be dismissed. The matter was of some public importance, and he should be glad to grant a case for appeal if one was asked for.

THE EXAMINATION IN ARCHITECTURE.

SIR,—I have no intention of entering into a personal controversy with Professor Kerr, and therefore am content to leave the observations in his letter of last week [p. 182] unnoticed; but the interests of intending candidates render it necessary that the misleading statement, "nearly a hundred books are catalogued as representing *part* of the reading required," should not be allowed so to pass without comment.

In the application paper to be sent in by each candidate he is required to select one period with the architecture of which he will be expected to show a thorough acquaintance; the "list of selected books" is intended to enable him to ascertain the best and most accessible standard works on that particular subject, to the study of one or more of which he will then apply himself. Thus, should he select Greek, his attention would be directed to Stuart and Revett, Wilkins, Cockerell, Penrose, &c. Should he have preferred a Mediæval period, he would select from the list under that head such books as would best satisfy his requirements, and obviously would not need to trouble himself about the others further than from such as may be accessible to him to acquire such knowledge of the other styles as may be desirable.

The Examination is intended as a test of the knowledge the candidate may possess of the professional subjects set out in the programme; the sources from which that knowledge has been obtained may be widely various, and, from whatever source obtained, a reasonable acquaintance therewith will carry the candidate through.

Although the wider range of study indicated by the "advice" is most desirable, candidates whose chief source of book knowledge has been "Gwilt's Encyclopædia" have passed creditably, and have expressed their appreciation of the "list of selected books" as useful for guidance in their future studies, rightly considering that passing the Examination was not the conclusion, but rather the commencement of earnest study.

The limit of age for admission to the Institute is, according to the Charter, twenty-one years, but it is not expected that many candidates will offer themselves at that age. In paragraph 1 of the "Regulations and Programme," the candidate is recommended not to enter himself for examination under the age of twenty-three years. Some have come forward before this age,—even soon after attaining twenty-one years,—and passed well, but at twenty-three the Examination should be passed with comparative ease.

Different opinions are held as to the expediency of publishing the examination papers, some thinking such a course as likely to mislead rather than to assist; the subject has been under consideration, and some course will probably be adopted which will be satisfactory to future candidates.

I may take this opportunity to express my regret that steps have not as yet been taken to establish a preliminary examination for younger students (such as existed in connexion with the Voluntary Examination). Its necessity is be-

ginning to be admitted; its consideration will, I hope, at no distant day, come before the Council, and a scheme be submitted for adoption by the Institute. Then, following this, student classes connected with the Institute, and under the guidance of the Architectural Association, and of local societies, could be formed in London and the provincial centres; the young pupil at his entry into the profession, whether in London or the provinces, would be brought into direct relation with the Institute, and follow the course of study prescribed by it, which would lead naturally from student to "Associate," and then, in due time, to "Fellow."

The Institute would thus surely bring within its influence and enrol among its members the great body of the profession throughout the country. It would soon become really the Institute of British Architects, and the status of the profession would be materially improved.

With reference to my letter in your issue of the 16th inst., I can only repeat the offer therein made, and assure intending candidates that whatever reasonable assistance and advice it may be in my power to afford to them will at all times be freely given, and with much pleasure. ARTHUR CATES.

7, *Whitehall-yard, S.W.*, January 25, 1886.

SIR,—It is with great surprise that I read in your issue of last week a letter on this subject from one whose name is familiar to most students in architecture, and who, presumably, in his professional capacity, is interested in their welfare.

My surprise is the greater when I recollect that but a few weeks ago Professor Kerr so ably championed the cause of the younger members of the profession during the consideration of the new Charter of the Institute, thereby winning their gratitude, which I, for one, sincerely hope is not misplaced.

The ungracious language of the letter towards the action of one who has for so long identified himself with the educational works of the Institute seems to me singularly inopportune, for, however opinions may differ as to Mr. Cates's line of action, I think none who know anything of him, either in public or private, will question the unselfish and, indeed, generous spirit of the offer made by him as a member of the Examining Board.

That the advice of a successful professional man is valued, is evidenced by the fact that several young fellows have already, to my knowledge, consulted Mr. Cates on the Examination question since the publication of his letter, and my advice to others is that they should do the same.

There having been of late a very general wail in all parts of the country on the discursiveness of the ordinary architectural education, surely any advice from one having wide experience, and who is constantly meeting professional men with the most varied practice, should be welcomed rather than repelled.

I hardly like to suggest that Professor Kerr fears there may be here an encroachment on the special functions of the professor in the Chair of Architecture at King's College, and a certain jealousy as the source of his complaint, but it seems to me the policy of the Examining Board, as criticised, is merely a side issue.

Professor Kerr comments on the number of books recommended for study. These, it will be found, are classified under different heads, and as in certain subjects but one section is taken up by the candidates at the examinations, the number is at once reduced materially. Surely, anyone will see the utility of a wide selection of books, when the loan collections are limited, and, to many, certain of the more costly standard works almost inaccessible.

I, for one, would wish Professor Kerr more enjoyment at the *séances* of the Charter Committee, but cannot help thinking that if he evinces the same spirit on those occasions as he does in his letter, the rest of the Committee cannot sit on a "bed of roses." FRANCIS HOOPER.

No. 1A, *Craig's-court, London.*

"PLUMBERS AND PARLIAMENT."

SIR,—Your correspondent "F. M." [p. 182] will see from the letter addressed to the Plumbers' Company, written at my suggestion by Mr. Henshaw, that the sneer he has been pleased to use at the Central Association of Master Builders was quite uncalled for.

The Association watches with the keenest interest all questions likely to affect the trade, but does not consider it wise, for the sake of superficial effect, to dabble in a noisy and ostentatious manner in matters which are being dealt with by others.

If representatives from this Association can co-operate usefully with the Plumbers' Company in accomplishing an improvement in that particular branch of the building trade, which I think they can, we shall be happy to do so, but if the Company are indifferent to any help we can afford, I think, speaking for myself, that is no valid reason for our opposing one of the old City Guilds from exercising their proper vocation and setting a good example to the other guilds to do likewise.

Whether their seeking legislative interference is wise or not is, to my mind, a very moot question. I should have imagined that they can, as a guild, render all the assistance that the trade needs in the way of examination and granting certificates without power from Parliament.

It is obvious that now the public are so keenly alive to sanitation they will recognise the importance of having properly-qualified workmen to carry out the most important part of sanitary work.

From the tenour of Mr. Shaw's letter in your issue of the 16th inst., I infer that the communication of our Secretary has been overlooked. Whether that be so or not, he will see, from the tone of the correspondence which has taken place on the subject, how desirable it is that the inconvenience pointed out by the "C. A. M. B." should be considered and provided for in any new arrangements which may be agreed upon.

F. J. DOVE,
President of the Central Association of Master Builders of London.

SIR,—Your correspondent, "F. M.," asks a very pertinent question. "Why do not the Masters' Association take up the matter of the hours worked by the plumbers?"

I would point out to him that the Association is hampered by two parties who would combine to frustrate its efforts. I find on inquiry that on Nov. 23rd, 1874, after much arrangement and negotiation, a conference was held, at which, however, only two representatives of the plumbing trade attended, to discuss the hours worked by plumbers, arising out of a strike. After anxious discussion it was found that no action could be taken, through the unwillingness of the master plumbers to disturb the relations, although then strained, existing between them and the men. In fact, a courteous, but so decidedly firm, opposition was shown to take any steps at all, that the matter was dropped.

With regard to Mr. Shaw's letter, I cordially agree with him in a desire to increase the efficiency of the plumbers' trade, for it must be admitted that there is plenty of room for it. It is strange that this very virtuous resolve on his part has been delayed so long; but still more strange,—in fact, it is a coincidence,—that the strengthening of the Company by a large influx of working plumbers (I suppose to make it look more representative), this alliance with experts and architects, should be simultaneous with a growing practice on the part of architects to make plumbers' work, in builders' contracts, a provisional amount, the result being that some architects employ their own pet plumbers, and the British public has to pay accordingly for the privilege. Not having seen Mr. Shaw's scheme, I cannot, of course, "recognise" "his object." I daresay it is a very good one, and I would ask him to take us into his confidence, and to divulge what it is.*

Mr. Henshaw's letter answers Mr. Shaw's remarks as to his desire to co-operate with the builders. I would only remark that I have made inquiries, and can find that only the late Master of the Tylers and Bricklayers' Company was invited to a dinner, not to the conference. C. A. M. B.

SEWAGE PURIFICATION

SIR,—Chemists, Engineers, Sanitary Authorities, and all those who are engaged upon the science of sewage treatment, as well as the general public, should feel indebted to Dr. C. Thresh for his excellent article published in your journal [p. 115, *ante*] on "Sewage Purification."

The four tests and general formulæ laid down by him are exceedingly to the point, and I am desirous of endorsing his views, namely, that all therein demanded must be satisfacforily met by any method of sewage treatment, or it is quite unworthy of adoption.

As Public Analyst for the Borough of Guildford, I believe I am reliably informed when I state that no real and serious idea of adopting Mr. Conder's process was ever entertained by the authorities of that town. I am very glad that Dr. Thresh has taken upon himself to publish the particulars of the trials made, seeing that so much was claimed and so little done. Articles appeared in various organs enlarging upon the wonderful discovery made by Mr. Conder, that small quantities of ferrous sulphate produce marvellous effects upon sewage, and it would appear from them that all those who are now labouring in this field of research may cease to work, and consider the great problem as completely solved by that gentleman.

ARTHUR ANGELL, Ph.D., F.I.C., &c.

* Our correspondent will be able to inform himself on the subject if he will read the report of the plumbers' conferences which appears on another page.—ED.

TIMBER MEASUREMENT.

SIR,—I thank "Godalming" and Mr. Staines for their letters [p. 143, *ante*]. But I am not quite sure that all timber measurers know so much about the subject as they do. If I had found it so, I should probably not have troubled you with a letter. Certainly, one to whom I showed my calculation (put as clearly as possible), replied, "It can't be done so. The content is 75 ft. 11 in." (*i.e.*, according to his tables).

Another, steward to a large estate, replied, "I am very pleased with Hoppus's measurement of timber." These seemed to me to show ignorance of the subject.

A gentleman connected with H.M. dockyards said, "We never measure sap." Of course he spoke only of oak; but Hoppus's tables are for all timber; therefore, it is not sap he deducts 20 per cent.

"Godalming," in his first letter [p. 107, *ante*], shows how Hoppus *may* have been led into the mistake; but I think it would have been more creditable to a compiler of tables if he had tested carefully, before assuming, that a rough-and-ready rule which had been proved false for a rectangle held good for a circle. To me it seems that Hoppus was the blockhead. "Godalming" reminds me that the so-called quart bottles hold only a pint and a half. I remember public attention being called to this fact some years since, and I often now see bottles stamped "Imperial quart," so that the public may see if they keep their eyes open.

I agree with Mr. Staines that Mr. Hoppus's measure is a fair mean between the gross content and the squared timber; but Hoppus does not tell us this, and I see no reason to think he meant it. Besides, why do we want a mean? In such a simple matter, let us have either one thing or the other, and not the mean, which is neither.

Hoppus's rough measure might do in the days when the crowning test of arithmetical knowledge was what "Godalming" tells us; but surely it is not suited for an age when many a Board schoolboy can show its inaccuracy. It is quite as convenient to use tables founded on truth as on error.

Of course, the trade *may* know that Hoppus gives 20 per cent. under the actual content, and may value accordingly; and if correct tables were substituted for the present ones, prices might have to be adjusted; but it seems to me that it would be more satisfactory both to buyer and seller to do this than to continue to deal on a false system of measurement, which ought long since to have been given up. J. WARDALE.

*** This letter was sent too late for appearance in our last issue.

British Archæological Association.—At the meeting held on the 20th inst., Mr. G. R. Wright, F.S.A., in the chair, several interesting objects of antiquity were exhibited by various members, among which may be named a series of drawings of Moulton Church, Northants, by Mr. E. Law, showing the recently-discovered window, apparently of Saxon date, over the arcade of the north aisle, which is of early thirteenth-century work, the window having existed previously in an older wall. Foundations have been met with of a still earlier church which had a nave 14 ft. wide and a chancel. Mr. Loftus Brock, F.S.A., pointed out that the present chancel arch of the existing church still occupied the fame position as that of the first small church erected on the site. While the building had been rebuilt several times and greatly enlarged, the position of this arch had never been altered. The first paper was by Mr. Syer Cuming, F.S.A. Scot., on the old traders' signs in Westminster Hall. For fully a century and a half the Hall was employed as a sort of bazaar, the stalls being rented by booksellers, law stationers, and sempstresses. The danger of such an occupation was pointed out, the magnificent hall having barely escaped destruction in consequence, since on February 20th, 1630-1, it was actually on fire by the burning of the little shops. Reference was made to many old authors, and quaint extracts relating to the sale of wares were quoted, the anomaly of these sales close to the Courts of Law being dwelt upon. There is a drawing by Gravelot about 1735, which shows the arrangement, the courts being at the upper end of the Hall, and a line of shops or stalls on each side. The second paper was on the History of the Church at Barnack, communicated in notes by the late Rev. — Haig to the Rev. Canon Argles. Both papers were read by Mr. W. De Gray Birch, F.S.A.

The Student's Column.

FOUNDATIONS.—V.

WHEN a building of considerable weight has to be erected on a site that is known to be, to some extent, unsound, the whole site is sometimes covered with concrete, and that is usually an effectual precaution. But there is a case in which a large building that was erected upon a bed of concrete 5 ft. thick has gone over rather considerably, owing, as it seems, to the greater thickness, or perhaps the greater softness, under one side of the site, of the marshy subsoil on which the whole building stands. Such cases show the utility of examining the soil under several parts of a site; and, as it is impossible to calculate the extent to which such settlements may go, it is best where great irregularity exists to sink through such a soil to something that is more solid and reliable. When a building leans to a considerable extent the question whether it is dangerous or not is one for those who know the nature of the subsoil and are familiar with the effects produced by such irregularities as have been indicated. The existence of these irregularities is generally a matter of notoriety locally, but an acquaintance with geology renders one better able to judge of this matter with such help.

A soft subsoil underlying a thin layer of hard surface soil occurs where the silt or mud of a former lake or estuary has become covered with a bed of clay. This bed will, according to its thickness, support a building of more or less weight, and this can best be judged of by reference to other buildings in such a locality. Where the clay is 4 ft. or 5 ft. in thickness a very considerable weight may be placed upon it, so long as the surface is not cut into or disturbed. In some places it is the practice to refrain from removing even the turf from such a site, the brickwork or concrete being put directly upon it, as evidently appears to have been done in beginning the walls of many of our old churches. An instance of failure is usually more instructive than one which has resulted in success. An architect who was building, for the first time, on such a site, being determined to form his foundation in the manner to which he was accustomed, cut nearly or quite through the stiff upper stratum in order to make the trenches for concrete. As the walls and piers of his church rose they sank down more or less according to their weight, so that wide cracks appeared at their junctions. The bed of clay actually existing would have carried such a building very well, though it would not have carried a heavy tower, for which a more solid foundation would have had to be found below the bed of silt by piling or otherwise.

When a tower or other structure unusually heavy is part of the same undertaking with a building of ordinary size, and the nature of the ground is such that the foundations for the two structures must be made in different ways, they should be built separately, even if they must be in close contact, in which case they should not be united until they have had time to settle, each to the extent due to its weight and foundation; but it is better to build the tower of a church or the chimney of a factory quite clear of the lower building when the soil is of such limited capacity for support. In the flat parts of Italy the campaniles, or bell-towers, were usually placed at some distance from the churches, and the same arrangement has been carried out in this country, in both ancient and modern times, though not always for the reason above named.

In the construction of large chimney-shafts extensive works are commonly undertaken in order to provide foundations, unless they can be built on the solid rock. Concrete beds of such dimensions as 30 ft. in diameter and 5 ft. or 6 ft. in thickness are provided with the object of spreading the weight and also diminishing the risk of inequalities in the subsoil. But where serious inequality exists the site is unfit for a building of this kind, as no means exist for precisely calculating the effect of such inequality, nor can the evil that may result be remedied with any degree of certainty. One of the most serious disasters of recent times was due to the placing of a large chimney partly over the disused shaft of a mine which had been filled up, but without the use of sufficient means, otherwise to render the whole area of the foundations uniform.

An architect who is at liberty to exercise his own judgment will, by choice, avoid placing a tall building upon a soft or irregular site, and will spread his design over a wide area rather than get the required accommodation by means of several stories. If that could always be done there would be but little art in the formation of foundations. The great use of such art is found in dealing with problems that are difficult, and are imposed upon us by a masterful necessity. Yet it may be said of the use of concrete on such soils and for such purposes as come within the experience of architects that the matter is well within the powers of any one who will take reasonable trouble and use good ordinary judgment. With all that may be laid down as to the proper composition of concrete and its proper application, it is very rarely indeed that an instance of failure occurs in a foundation that has been designed and carried out on the system in everyday use. It may be strongly suspected that, where the concrete is sufficient in quantity, but of very bad composition, its sufficiency as a foundation is due to a principle altogether different from that which is aimed at by us when we try to make a trench of concrete act as a rigid bar fitted to and carried by the bottom soil.

A trench of sand formed in a very soft or spongy foundation will, in such a position, be a better support than a bed of solid concrete, for the effect of it is to spread the weight of a wall over the sides as well as upon the bottom of the trench. It is necessary, however, that the soil shall be so retentive as to prevent the escape of the sand from the trench. The sand acts under these conditions very much like a fluid. Some notion may be formed of its effects by recalling to mind the accidents that occasionally happen through the muzzle of a gun getting stopped with a little sandy earth, when it is made to burst upon being fired, owing to the pressure of the soil against the inside of the barrel, instead of being forced directly out of the muzzle. The same thing may be studied experimentally by burying in loose sand any small disk with a string attached to its centre, and noting the force that is required to draw it up owing to the pressure being exercised, not only on the sand immediately above, but upon an inverted cone of sand spreading out as it rises upwards from the disk. The same principle has been applied in making foundations in soft ground by driving down in many places under the walls a model of a pile and then carefully withdrawing it and filling the cavity with clean sand. Though there is no reason to doubt the result of these operations, they are probably never actually brought into use in this country, but we may see by their means how concrete, which might be so very slightly cemented as to crush, would, in its disintegrated condition, act by pressure on the sides of the trench. Indeed, there is no doubt that a trench or a bed of clean gravel would, in proportion to the roundness and smoothness of its materials, act in the same way as a trench or bed of sand. It would, however, be well that any one trying this experiment should try it with a building of some capacity for accommodating itself, as a timber-framed building would do, to any slight movement in the sand or gravel, while it was gradually settling down tight into the trench.

Separate Sewage Systems. — At the Parkes Museum of Hygiene, Margaret-street, Regent-street, on the 21st inst., Mr. R. F. Grantham, M.I.C.E., delivered a lecture on "The Working of the Separate Sewage System." The chair was occupied by Professor W. A. Corfield, M.A., M.D. (Oxon), who briefly introduced Mr. Grantham. The lecturer commenced by referring to the opinion expressed by Sir Joseph Bazalgette in 1865, in a paper on "The main drainage of London," in which he objected to the theory of separation of rain water as impracticable in the case of London. While, having regard to the opinion held at that time, and to the general knowledge of the subject, it was impossible to deny the soundness of the reasoning upon which the present system of sewering London was more than twenty years ago carried out, yet the system of separating the rain water from the sewage has been steadily gaining ground, until the Royal Commissioners on Metropolitan Sewage Discharge, impressed with the difficulties of the complete carrying out of the separation theory, advised that some middle course might have been found.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

JAN. 18.

By W. BARRETT.

Camden Town—115, Arlington-road, freehold.....	£705

JAN. 19.

By WALKER & RUNTZ.

Bethnal-green—22 to 28 even, Usk-street, freehold	1,135
Willesden—The Craven Park-mews, 99 years, ground-rent 5*l.*	1,295

By THURGOOD & MARTIN.

City, Great Tower-street—Ground-rent of 123*l.*, reversion in 75 years	3,220
Finsbury Park—113 and 115, Moray-road, 78 years, ground-rent 12*l.* 12*s.*	510

By DEBENHAM, TEWSON, & CO.

Snaresbrook — Improved Ground-rents of 57*l.*, term 70 years	1,020
Wanstead—A Plot of Land, 0a. 1r. 17p., term 70 years, no ground-rent	320

By DRIVER & CO.

Hyde Park—35, Craven Hill Gardens, 48 years, ground-rent 35*l.*	2,750

By F. W. GLASIER.

Battersea—6, Victoria-road, 88 years, ground-rent 7*l.* 10*s.*	430

By HORNER & MORTON.

East Dulwich—1, Heber-road, 85 years, ground-rent 8*l.* 8*s.*	310

JAN. 20.

By HOBSON, RICHARDS, & CO.

Kensington — 25, St. Mary Abbott's Terrace, 18 years, ground-rent 13*l.* 10*s.* 10*d.*.....	810
Wandsworth—4, Rose Villas, 91 years, ground-rent 6*l.*.....	270

By G. A. BICKERTON.

King's-cross — 34 to 44 even, Britannia-street, 61 years, ground-rent 30*l.*.....	2,100

By FAREBROTHER, ELLIS, CLARK, & CO.

South Hampstead—14, Fairfax-road, 69 years, ground-rent 10*l.* 10*s.*	870

JAN. 21.

By DALE & SON.

Mile End-road—Nos. 473 and 475, 16 years, ground-rent 28*l.*	390

By BALL, NORRIS, & HADLEY.

Haverstock-hill—130, Adelaide-road, 66 years, ground-rent 10*l.* 10*s.*	675

MEETINGS.

SATURDAY, JANUARY 30.

St. Paul's Ecclesiological Society.—Annual meeting. 2·30 p.m.

MONDAY, FEBRUARY 1.

Royal Institute of British Architects.—(1) Announcement of Royal Gold Medallist. (2) Mr. Wyatt Papworth on "The late Professor Donaldson's connexion with the Institute." (3) A short Memoir of the late Professor Donaldson will be read by Mr. E. A. Gruning. 8 p.m.

Royal Academy of Arts.—Lectures on Sculpture: Mr. A. S. Murray on "The Principles of Bas-Relief as observed in the best age of Greece." 8 p.m.

Society of Engineers.—Inaugural address by the President, Mr. P. F. Nursey. 7·30 p.m.

Society of Arts (*Cantor Lectures*).—Professor H. S. Hele Shaw on "The Mechanical Applications of Friction." 8 p.m.

Architectural Section of the Philosophical Society of Glasgow.—Mr. James Chalmers on "The Planning and Sanitary Requirements of Farm Steadings."

TUESDAY, FEBRUARY 2.

Society of Biblical Archæology.—Mr. I. W. Simpson on "The Tower of Babel and the Birs Nimroud Suggestions as to the Origin of the Mesopotamian Tower Temples." 8 p.m.

Royal Institution.—Mr. R. Stuart Poole on "Naucratis." II. 3 p.m.

Institution of Civil Engineers.—Discussion on Mr. C. E. Stromeyer's paper on "The Injurious Effect of a Blue Heat on Steel and Iron." 8 p.m.

WEDNESDAY, FEBRUARY 3.

Society of Arts.—Mr. George Simonds on "Artistic Bronze Casting." 8 p.m.

British Archæological Association.—The Rev. C. Collier on "The Excavations now in progress at Winchester Cathedral." 8 p.m.

Builders' Foremen and Clerks of Works' Institution.—Ordinary Meeting. 8·30 p.m.

Institution of Civil Engineers of Ireland.—Mr. W. R. Maguire on "Technical Education for Artisans." 8 p.m.

THURSDAY, FEBRUARY 4.

Royal Academy of Arts.—Lectures on Sculpture: Mr. A. S. Murray on "The Later History of Bas-Relief in Greece." 8 p.m.

Institution of Mechanical Engineers.—Annual General Meeting; "Description of Tensile Tests of Iron and Steel Bars, by the late Mr. P. D. Bennett, of Tipton." 7·30 p.m.

Society for the Encouragement of the Fine Arts.—Professor Kerr on "The Art Scepticism of the Day." 8 p.m.

Parkes Museum of Hygiene.—Dr. G. A. Heron, on "How it is shown that living things cause some of the diseases of man." 8 p.m.

Royal Archæological Institute.—The Rev. J. R. Boyle on "The Crypt of St. Wilfrid's Church, Repton." 4 p.m.

Edinburgh Architectural Association.—Mr. Frank W. Simon on "Wood Carving, with special reference to Germany." 8·30 p.m.

FRIDAY, FEBRUARY 5.

University College.—Professor C. T. Newton, C.B., on "Greek Inscriptions." III. 4 p.m.

Royal Institution.—Mr. T. Pridgin Teale on "The Principles of Domestic Fireplace Construction." 9 p.m.

Institution of Mechanical Engineers.—Annual General Meeting continued. 7·30 p.m.

SATURDAY, FEBRUARY 6.

Association of Public Sanitary Inspectors.—Mr. T. Buckworth on "The Sale of Food and Drugs Acts." 6 p.m.

Election of an Associate of the Royal Academy.—At a general assembly of the Royal Academy, held on Wednesday evening, Mr. J. Seymour Lucas, painter, was elected an Associate.

Miscellanea.

Panama Canal.—The Paris correspondent of the *Times* informs us that M. de Lesseps has started off, with a staff of delegates from the principal chambers of commerce, engineers, and secretaries, to examine into the present state of the Panama Canal works, and place himself in a position to reply to the criticisms that have been made upon it. We fear there is little doubt that things have been represented in too *couleur de rose* a manner; but M. de Lesseps is of a sanguine temperament, and perhaps has been himself deceived in his calculations. At all events we shall be very glad to hear that he is able to refute his adversaries. M. de Lesseps is now eighty, and informed the *Times* correspondent that he "could not die before opening his second canal," and we are very much disposed to believe him.

St. Paul's Ecclesiogical Society.—In the seventh annual report of this society, to be presented at the annual meeting to-day (Saturday, Jan. 30) the council congratulate the members upon the position and prospects of the society. Ten meetings have been held at the Chapter House since the last report, and the following papers have been read:—By Mr. H. Roumieu Gough, on "Some Ecclesiastical Antiquities, English, Irish, Scotch, and Welsh"; by Mr. Arthur Taylor, on "The History of Stained Glass"; by Mr. Charles Browne, on "The Ecclesiology of the Roman Catacombs"; by Mr. Somers Clarke, on "Some Churches of North Germany"; by Mr. E. P. Loftus Brock, entitled, "Some Notes on London Churches"; by Mr. G. H. Birch, on "The Ecclesiology of Paris"; by Mr. W. H. St. John Hope, on "Mediæval Chalices and Patens"; by the Rev. C. L. Acland, on "The most remote Church of Great Britain"; by Mr. Spenser Nottingham, on "The Common-sense Use of the Church's Plain-Song"; and by Mr. H. Roumieu Gough, entitled, "An Architect's Views on Modern Church Building." The following afternoon visits were made during the year:—To the churches of St. Giles, Cripplegate, and St. Sepulchre, Snow-hill, where papers were read by Mr. G. H. Birch; to Merton Abbey, and the Churches of Merton and Morden, under the guidance of Mr. Arthur J. Style; to the old and new parish churches of Chelsea, and to Chelsea Hospital Chapel, which were described by Mr. Somers Clarke; to Chaldon, where Mr. J. G. Waller read a paper on the Wall-painting, and Merstham, where Major Heales read a paper; and to Hedsor and Cookham, under the guidance of Mr. Montague Hepworth. Excursions were also made to Chichester, where Mr. Gordon M. Hills received the members, and acted as guide; and to Peterborough, where the Rev. W. D. Sweeting conducted. The balance-sheet shows the financial position of the society to be satisfactory. There are now 329 members on the register.

A New Metropolitan Police-Station.—A new police-station has just been erected in Trinity-road, Upper Tooting. The building has a frontage to Trinity-road 58 ft. in length, with a return frontage in St. Nichol's-road 54 ft. long. It is faced with red brick and Mansfield stone, and contains three floors. The apartments on the ground-floor consist of the inspector's office and private rooms, the charge-room, writing-room, waiting-room, and cells. The first floor contains the officers' day-room, mess-room, and dormitories for unmarried members of the force, the second floor also containing similar dormitories and bath-rooms. The building and exercise-yard occupy an area of about 10,000 ft. Mr. John Butler, architect to the Metropolitan Police authorities, designed the buildings; Messrs. Carless & Co., of Richmond, being the contractors, and Mr. John Roberts general foreman of the works.

Wrought-iron Casements and Frames.—Messrs. Burt & Potts, of York-street, Westminster, have sent us their new illustrated catalogue of the excellent wrought-iron casements and frames manufactured by them. These casements are absolutely water-tight, and have stood the test of long experience. Section No. 9 may be particularly recommended. The catalogue will be found very useful for reference both by architects and builders.

Paving.—The tender of Wilkes's Patent Metallic Paving Company has been accepted by the Great Eastern Railway for paving the whole of the platforms at their Norwich Thorpe Station, upwards of 5,000 square yards in extent.

The Local Government Board and "the Mortlake Scheme."—The inhabitants and owners of property in the district of Kew Gardens and the neighbourhood have sent a memorial to the Local Government Board urging it to refuse its sanction to the sewage scheme which the Richmond Vestry and the Rural Sanitary Authority of Richmond are promoting for the drainage of the parishes of Richmond, Kew, Barnes, Mortlake, and Petersham. Objection is taken principally to the site, known as the "Mortlake Site," of the proposed sewage works, and, as the memorial sets forth, on the following gronnds:—"1. The establishment of sewage works in the immediate vicinity of a large and rapidly-growing residential district, covered to a great extent by houses of considerahle value, would become a great nuisance, and considerably depreciate the value of property. 2. That the proposed site is, owing to the nature of the land, from the best opinion that the petitioners have been able to obtain, altogether unsuited for sewage works. 3. That owing to the proposed works being only a quarter of a mile from Kew-gardens Railway Station, the popularity of the gardens will diminish, and the pleasure of many thousands of visitors will be seriously affected if the proposed works are erected. 4. That the selected site for the sewage works is identical with that which Parliament has rejected. 5. That several alternative, better, and less costly schemes have been prepared for dealing with the sewage, which are not open to the serious objections of the scheme selected by the Richmond Vestry. 6. The site selected for the sewage works by the Richmond Vestry is one adjoining a most attractive part of the river Thames, which, if the works were established, would be irretrievably injured." Notwithstanding the opposition which the announcement of the adoption of the scheme has aroused, the Richmond Vestry has resolved to proceed with the matter; and a Local Government inquiry will be held, at which not only the representatives of the inhabitants of the above-mentioned districts, but counsel for the Duke of Devonshire, one of the owners adjoining the site, will be present to oppose it.

An "Immense" Granite Slab.—America is, as everybody knows, the land of "big" things, and every day, almost, we hear of fresh marvels of bigness. As our contemporary *Iron* remarks, it can be "no easy task to separate from the main ledge a slab of granite 354 ft. long, 3 ft. to 4 ft. thick, and 11 ft. wide. But this, it appears, has been accomplished at the Flynt Granite Quarries, Monson, Massachusetts, and by the means usual in all quarries for separating slabs or blocks from the main ledge. A row of wedges were set, several hundred in number, and the workmen, beginning at one end, gently and carefully tapped the wedges, moving by degrees down the line until the other end of them was reached, when the same operation was repeated. In this manner, by careful and patient application, aided by favourable conditions of the weather, the slab of the above phenomenal size was successfully separated from the main rock." We are informed that the value of this immense slab, "if it could have been transferred safely to one of the large cities of the United States, at not too great a cost, would have been several thousand dollars. It seemed almost sacrilegious that it was necessary to cut it up into smaller blocks for transportation, and to finally use it for ordinary building purposes: but it had to be done. The possibility of getting out a slab of such size without breaking it shows that the grain of the Monson granite not only runs evenly, but that it possesses great tenacity."

Free Lectures to Artisans.—A second course of eight free lectures to artisans and others connected with the building trade is announced to be given on Wednesday evening, at eight o'clock, at the Carpenters' Hall, London Wall, on "Matters connected with Building." The first of the course will be given on February 17th, by Mr. Thomas Blashill, F.R.I.B.A., when the subject will be: "Timber; its growth, seasoning, and preparation for use." Tickets, admitting to the course and naming the subjects, may be obtained at the Hall after February 2nd.

Royal Academy of Belgium.—Sir Frederick Leighton has been elected an Associate of the Royal Academy of Belgium in place of the late Mr. Louis Haghe, and Mr. A. Waterhouse has replaced the late Mr. Donaldson in the section of Architecture.—*Athenæum.*

Royal School of Mines.—Prof. Warington Smyth, F.R.S., in continuing his lectures upon Mining, in the theatre of the Geological Museum, Jermyn-street, discussed the various considerations necessary before entering upon operations in detail. The matter of partnership and the conditions under which the mineral may be removed are necessary preliminaries; then comes the matter of machinery, and the nature of its power, and if water, whether it can always be obtained upon the spot, or whether it will be necessary to collect it in reservoirs, or convey it for a long distance; the means of carriage to or from the mine and the probable necessity of forming new means of communication; together with the yield of timber in the neighbourhood for working of the mine, as well as other fuels for smelting operation when necessary. The matter of wages then becomes an important item, and, in this connexion, the skill of the men in the district and proximity of their dwellings, and the possible necessity of erecting temporary barracks. Then management must be considered, as nothing is easier than to spoil a good mine by bad management, and when a mine has been thrown into bad shape, it is very difficult to get it into good form again. Lastly, the provision of stores and the accommodation of them is necessary, so that a man may not have to travel long distances in order to get a wheel repaired. If the value of any workings is estimated without taking all the points into consideration, the financial outlook will be a poor one.

The Iron, Hardware, and Metal Trades' Pension Society.—The forty-third annual general meeting of the Iron, Hardware, and Metal Trades' Pension Society was held at the offices of the Institution on Wednesday last, Mr. Robert Henry Pearson, Vice-Patron and Treasurer, presiding. The president, trustees, and London, Birmingham, Sheffield, and Wolverhampton committees were severally re-elected, with the addition to the Birmingham committee of Mr. Wm. Tonks, and the following gentlemen were elected vice-patrons and vice-presidents respectively:—Vice-Patrons: Mr. J. T. Smith, of Barrow-in-Furness; Mr. R. W. Moser, Southwark; and Mr. Henry Gallimore, Sheffield. Vice-Presidents: Sir Henry Bessemer, F.R.S.; and Mr. W. G. Ainslie, London. At the seventy-seventh election of pensioners, which subsequently took place, the successful candidates were:—John Stones, Sheffield, 578 votes; William Cooke, Sheffield, 379; William James, Portishead, 357; William Smithers, London, 277; Mary Ann Durham, London, 1,924; and Mary Ann, Wilson, Birmingham, 1,521. Louisa Yorke, being the highest unsuccessful candidate, received the gratuity of five guineas presented at each election by the Falkirk Iron Co.

The Green Dragon Tavern, Fleet-street, has just been rebuilt. The building is 76 ft. in height from the street-pavement level, and contains six floors. The ground floor is faced with red Aberdeen polished granite pilasters and columns, the materials of the upper portions of the façade consisting of Portland and Corsehill stone, the last-named materials forming the most prominent feature. Above the ground floor there is a bold cornice, with a balcony at the foot of the first-floor windows. At each angle of this floor there are pilasters, whilst in the centre is a large elliptical arched window, and on each side smaller arched windows. The second floor has a central bay window, which is continued upwards to the third floor, and surmounted by a balcony. The fourth and fifth floors are entirely faced with Portland stone. Messrs. Frend & Keogh, of Hart-street, Bloomsbury, are the architects, and Messrs. Colls & Sons, of Moorgate-street and Camberwell, were the contractors.

"The Ancient Agrigentum."—In the *English Illustrated Magazine*, Mr. H. D. Traill writes a pleasant article on a month in Sicily, touching on its architectural remains, but not with any special knowledge. Some of his fellow-travellers knew still less, however, as he relates how a young Englishman informed his bride, as they approached the station, that "Girgenti is the ancient Agrigentum." "Yes, dear," replied the lady, demurely; "but what is the ancient Agrigentum?" and got no reply.

The "Hygeian Rock" Composition.—Mr. William White, of Abergavenny, the patentee of this composition, announces that Messrs. Haward Bros. & Co. have opened a depôt for its sale at Manor House Wharf, Nine Elms.

American Exhibition (in London), 1887. — We learn from the *Journal of the Society of Arts* that it has been arranged that this Exhibition shall be opened on Monday, May 2, 1887, instead of May 1, 1886. The Executive Council were prepared to carry out their original intention, but have yielded to the strongly-expressed opinion that it was unadvisable to hold the American Exhibition in the same year as the Colonial and Indian Exhibition.

The Maintenance of Cathedral Fabrics. The *Edinburgh Review* for January contains an article on the Report of the Royal Commission appointed in 1879 to inquire into the Condition of the Cathedrals of England and Wales. The Report is very freely criticised by the reviewer, who finishes, however, with an expression of entire concurrence with the opinion of the Commission that the preservation of the cathedral fabrics is the primary claim on the funds of the Ecclesiastical Commission which are derived from them. We quote the concluding lines of the article:—

"The only defence of a practical kind that was made last winter for not attempting a real restoration of the grand old Norman tower of Peterborough Cathedral, which was coming down if it had not been taken down in time, and for which the architect had discovered enough of the original features, was that it would cost more than had been subscribed (20,000*l.*) or was thought likely to be subscribed in these bad times, when the richest man in the diocese, if not in England, only gave 100*l.* If the Ecclesiastical Commissioners had recognised what this very mild-spoken Commission on Cathedrals at last ventures to call their primary duty, that difficulty could not have been pleaded by the obstructives. The absolutely necessary work would have been done out of general cathedral funds, and what may be called the architectural luxury of a grand restoration of the tower to its original state would have been covered by the subscriptions; for which it was said by the Dean, who wished for it, more conditional promises kept coming in while there was a chance of the proper thing being done. So we spoil a great cathedral for ever for want of 20,000*l.* to restore it as it was in its best days, and would have been still but for accidents."

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ....ton	6	10	0	7	10	0
Teak, E.I. ....load	12	10	0	15	10	0
Sequoia, U.S. ....ft. cube	0	2	6	0	2	9
Ash, Canada ....load	3	0	0	5	0	0
Birch "	3	0	0	4	10	0
Elm "	3	10	0	5	0	0
Fir, Dantsic, &c.	1	10	0	4	10	0
Oak "	3	0	0	5	0	0
Canada	6	0	0	7	0	0
Pine, Canada red	3	0	0	4	0	0
" yellow	3	15	0	5	5	0
Lath, Dantsic ....fathom	4	10	0	6	0	0
St. Petersburg	5	0	0	7	0	0
Wainscot, Riga....log	2	15	0	4	10	0
" Odessa, crown	3	12	6	3	15	0
Deals, Finland, 2nd and 1st...std. 100	7	10	0	8	10	0
" 4th and 3rd	6	0	0	7	10	0
Riga	6	0	0	8	0	0
St. Petersburg, 1st yel.	9	0	0	15	0	0
" 2nd "	7	0	0	8	15	0
" white	8	0	0	10	10	0
Swedish	6	0	0	15	10	0
White Sea	8	0	0	18	0	0
Canada, Pine 1st	17	0	0	31	10	0
" 2nd	12	0	0	17	10	0
" 3rd, &c.	7	0	0	10	0	0
" Spruce 1st	9	0	0	12	0	0
" 3rd and 2nd	6	0	0	8	0	0
New Brunswick, &c.	5	0	0	7	0	0
Battens, all kinds	4	0	0	12	0	0
Flooring Boards, sq. 1 in.—Prepared, first	0	9	0	0	13	0
Second	0	7	6	0	8	6
Other qualities	0	5	0	0	7	0
Cedar, Cuba....foot	0	0	3½	0	0	4
Honduras, &c.	0	0	3	0	0	4
Australian	0	0	3	0	0	3½
Mahogany, Cuba	0	0	5	0	0	7½
St. Domingo cargo av.	0	0	5½	0	0	7½
Mexican "	0	0	4	0	0	5
Tobasco cargo av.	0	0	4	0	0	6½
Honduras cargo av.	0	0	4½	0	0	6½
Maple, Bird'seye	0	0	3½	0	0	6
Rose, Rio ....ton	7	0	0	16	0	0
Bahia	6	0	0	14	0	0
Box, Turkey	5	0	0	18	0	0
Satin, St. Domingo ....ft.	0	0	0	0	0	0
Porto Rico	0	0	0	0	0	0
Walnut, Italian	0	0	4	0	0	5

METALS.	£.	s.	d.	£.	s.	d.
IRON—Pig in Scotland ....ton	2	2	6	0	0	0
Bar, Welsh, in London	4	15	0	5	0	0
" " in Wales	4	7	6	4	10	0
" Staffordshire, London	5	15	0	7	0	0
Sheets, single, in London	7	10	0	9	0	0
Hoops "	6	5	0	7	5	0
Nail-rods "	5	15	0	7	0	0
COPPER—						
British, cke. and ingt. ....ton	43	0	0	44	0	0
Best selected	45	0	0	48	0	0
Sheets, strong	50	0	0	0	0	0
" India	48	0	0	48	10	0
Australian, fine cash	0	0	0	0	0	0
Chili, bars "	39	12	6	40	2	6

METALS (*continued*).	£.	s.	d.	£.	s.	d.
YELLOW METAL....lb.	0	0	4½	0	0	4½
LEAD—Pig, Spanish	12	5	0	0	0	0
English, com. brands	12	12	6	12	15	0
Sheet, English	13	10	0	13	15	0
SPELTER—						
Silesian, special ....ton	15	5	0	15	7	6
Ordinary brands	15	0	0	15	2	6
TIN—						
Banca	96	0	0	0	0	0
Billiton	94	0	0	0	0	0
Straits	91	17	6	92	10	0
Australian	91	17	6	92	10	0
English ingots	97	0	0	0	0	0
ZINC—						
English sheet	0	0	0	0	0	0

OILS.	£.	s.	d.	£.	s.	d.
Linseed ....ton	19	15	0	20	0	0
Cocoanut, Cochin	29	10	0	30	0	0
Ceylon	26	0	0	0	0	0
Copra	14	0	0	15	10	0
Palm, Lagos	29	10	0	0	0	0
Palm-nut Kernel	25	0	0	0	0	0
Rapeseed, English pale	23	0	0	23	10	0
" brown	21	12	6	21	15	0
Cottonseed, refined	18	0	0	19	10	0
Tallow and Oleine	25	0	0	40	0	0
Lubricating, U.S.	7	0	0	10	0	0
" Refined	4	0	0	12	0	0
TURPENTINE—						
American, in cks. ....cwt.	1	7	6	1	7	9
TAR—Stockholm ....brl.	0	19	0	0	19	6
Archangel	0	13	0	0	12	6

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Public Library, &c.	Folkestone Town Cncl.	A. W. Conquest	March 1st	ii.
New Wing to Hospital, Shadwell	East London Hospital...	Not stated	March 31st	ii.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Making-up Roads	Wandsworth Bd. of Wks	*Official*	Feb. 2nd	ii.
Collection and Removal of Dust	do.	do.	do.	ii.
Enlargement of Workhouse, &c.	St. George-in-the-East Guardians	Wilson, Son, & Aldwinckle	Feb. 5th	xiii.
Erection of Sheds and Houses, &c.	Midland Railway Co. ...	A. A. Langley	do.	ii.
Ironwork for Bridges	do.	do.	do.	ii.
School for Boys, Aston Clinton	.....	W. Huckvale	do.	xviii.
Sewage Disposal Works	Burton-on-Trent Cor....	Jas. Mansergh	Feb. 6th	xiii.
Brick and Pipe Sewer (Labour)	} Lowestoft Corporation	R. H. Inch	Feb. 8th	xiii.
Sewer and Drain Pipes (Supply of)				
Stoneware Invert Bricks, &c. (Supply of)				
Portland Cement (Supply of)				
New Streets Works	Vestry of St. Giles, Camberwell	*Official*	do.	ii.
Sewerage and Paving	Belfast Town Council...	J. C. Bretland	Feb. 9th	xiii.
New Streets Works	Chelsea Vestry	G. R. Strachan	do.	xiii.
Kerbing, Tar-paving, &c.	Lewisham Board of Wks	*Official*	do.	xiii.
Kerbing and other Paving Works	Willesden Local Board	C. Claude Robson	do.	ii.
Road Materials	Com. of H.M. Works...	*Official*	do.	ii.
Alterations to Baths, &c.	Com. of Poplar Public Baths and Washhouses	Messrs. Clarkson	Feb. 10th	xiii.
Brick and Pipe Sewers	Vestry of St. Mary, Islington	*Official*	do.	xiii.
New Infant School	Woking School Board...	Welman & Street	do.	xiii.
Kerbing and Channelling	Dartford Local Board	*Official*	Feb. 11th	xiii.
Sewerage Works	Tonbridge R.S.A.	J. Mansergh	do.	xiii.
Public Baths, Library, and Assembly Rooms	Newcastle-under-Lyme Corporation	Sugden & Son	Feb. 12th	xiii.
Mortuary Chambers, Post-Mortem Room, &c.	Hornsey Local Board...	T. De Courcy Meade	Feb. 15th	ii.
New Cattle Markets	St. Ives Corporation ...	E. W. Robb	do.	xviii.
Main Drainage Works	West Bromwich Cor. ...	J. T. Eayrs	Feb. 17th	xiii.
Storage Reservoir, &c.	Northampton Cor.	T. & C. Hawksley	Feb. 19th	ii.
Quarters for Married Soldiers	The Sec. of State for War	*Official*	Feb. 20th	ii.
Works and Repairs, and Supply of Materials	do.	do.	Feb. 22nd	ii.
New Slaughter-Houses	do.	do.	Feb. 27th	ii.
Additions and Alterations to Infirmary	Swansea U. S. A.	H. Saxon Snell & Son	Not stated	xiii.
Removal of Refuse	Hull Royal Infirmary...	.....	do.	xiii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Borough Surveyor	Dewsbury Town Council	250*l.*	Feb. 5th	xvi.
Rating Surveyor and Valuer	Faversham Union	Not stated	March 4th	xvi.

TENDERS.

BALHAM.—For the erection and completion of five shops at Bedford Hill-road, Balham, for Mr. Williams. Mr. J. D. Mathews, architect:—

Walker	£4,256 0 0
Potterton	4,152 0 0
Wontner Smith & Son	4,021 0 0
Buller	3,889 0 0
Bugg	3,498 0 0
Grover & Son	3,387 0 0
Mills	3,347 0 0
Spencer	3,150 0 0
Killby & Gayford (accepted)	3,132 0 0

BETHNAL GREEN.—For erecting St. Matthias's Mission-house, otherwise Petley Hall, Chilton-street, Bethnal-green. Messrs. William Reddall & Son, architects, South-street, Finsbury:—

Pritchard & Son	£1,997 0 0
Woodward	1,980 0 0
Brass & Son	1,973 0 0
M. Gentry	1,945 0 0
Colls & Sons	1,889 0 0
Nightingale	1,887 0 0
Killby & Gayford (accepted)	1,868 0 0

BRISTOL.—For foundation-work, boundaries, &c., at St. Francis Church, Bristol. Mr. John Bevan, architect, Bristol:—

W. E. Walters & Son	£850 0 0
Geo. Humphreys	800 0 0
H. A. Forse	790 0 0
Stephens & Bastow	775 0 0
C. A. Hayes	757 0 0
E. T. Hatherly	737 0 0
W. Church	700 0 0
M. Kingstone, jun.	690 5 0
R. Wilkins & Sons	686 0 0
H. J. Rossiter	650 0 0
J. Wilkins	645 0 0
J. Perrott	640 0 0
A. J. Beaven (accepted)	628 0 0

DALSTON.—For the erection of three houses and shops in Parkholme-road, for Mr. E. B. Crichton. Mr. J. H. Jones, architect:—

J. Anley	£1,155 0 0
J. Godfrey & Sons	1,080 0 0
J. Jarvis & Sons	1,070 0 0
Burton & Son	1,045 0 0

EALING.—For the erection of three mistresses' residence in connexion with the new girls' schools, Christ Church, Ealing. Mr. Robert Willey, architect, Ludgate-hill:—

Nye, Ealing (accepted)	£368 0 0

EALING.—For the erection of a new residence and glass-houses in the Mount Avenue, Castlebar, Ealing. Mr. Robert Willey, architect:—

Nye, Ealing (accepted)	£3,358 0 0

HORNSEY.—For new play-room, and repairs at the Workhouse schools, Hornsey-road, for the Guardians of St. Mary's, Islington. Mr. W. Smith, architect:—

Ward & Lamble (accepted)*	£513 0 0

* For list see p. 187 last week.

LONDON.—For alterations and repairs at No. 30, Chapel-street, Edgware-road. Mr. Robert Willey, architect, Ludgate-hill:—

Jones & Sons, Ealing (accepted)	£335 0 0

LONDON.—For rebuilding No. 291, Commercial-road East. Mr. Robert Willey, architect:—

Clarke & Bracey, London	£898 0 0
Munday & Sons, London	670 0 0
Larter & Son, London	645 0 0

LONDON.—For alterations at 92, Charlton-street, for Mr. Preston. Mr. J. Savill, architect. Quantities supplied:—

Anley	£848 0 0
Jackson & Todd	847 0 0
Bidout	780 0 0
Royal	759 0 0
Spencer & Co.	740 0 0
Ward & Lamble	687 0 0
Hyde (accepted)	673 0 0

LONDON.—For building a front block of offices and chambers at No. 63, Lincoln's Inn-fields, London, W.C. Mr. William Simmons, architect, Long Acre. Quantities by Messrs. Nixon & Raven, Dartmouth-street, Westminster :—

	A.	B.	C.
Ansdell & Co. (Westminster)	£12,648	£508 less	£226 less
W. Oldrey (Westbourne Park)	11,657	270 less	150 more
Pawley	11,495	130 less	210 more
Drake & Co. (Battersea Park)	11,637	23 less	124 more
W. Marriage (City)	10,897	equal	equal
J. Chappell (Pimlico)	10,778	200 less	116 more
John Bottrill, Reading	10,755	75 less	250 more
Mark Gentry, City *	9,975	45 more	185 more

* Likely to be accepted.

A.—Amount if the plastering throughout be in Robinson's patent cement.

B.—Amount if the plastering be in trowelled stucco with cement angles.

C.—Amount if the whole of the plastering be in Keene's cement.

LONDON.—For rebuilding No. 162, Aldersgate-street, for Mr. Woolf Hyman. Mr. J. D. Mathews, architect :—

Killby & Gayford (accepted)	£2,750 0 0

[No competition]

LONDON.—For repairs to Nos. 272, 274, and 276, Hackney-road, for Mr. Matthews. Messrs. Gordon & Lowther, surveyors :—

Dye	£224 0 0
Taylor	209 0 0
Hyatt	177 0 0
Thomerson & Son (accepted)	177 0 0

LONDON.—For alterations to the Marquis of Anglesea Public house, Devonshire-street, Lisson-grove. Mr. R. A. Lewcock, architect, Bishopsgate-street Within :—

Walker	£438 0 0
Roome	383 0 0
Anley	382 0 0
Pringle	370 0 0
Shurmur	366 0 0
Marr	359 0 0
Jackson & Todd	347 0 0

LONDON.—For proposed chambers, 36, Maiden-lane, Covent-garden, W.C. Mr. W. Stair, architect :—

Perry & Co. (accepted)	£8,750 0 0

LUTON.—For the alteration and addition to the Crown Inn, Market-hill, for Mr. S. L. Seckham, Northampton. Mr. W. J. Pearson, architect. Quantities not supplied :—

C. Wright	£1,040 0 0
Smart Bros.	1,010 0 0
Neville Bros.	935 0 0
Rance Bros.	930 0 0
D. Dunham & Son	897 0 0
Slough Bros.	890 0 0
D. Parkins	862 0 0
Cox Bros.	850 0 0
G. Pryer	850 0 0

NORTHFLEET.—For the erection of new Board schools, for the Northfleet School Board. Mr. A. L. Guy, architect :—

W. Nightingale, Gravesend	£4,799 0 0
Benning & Sons, Maidstone	4,650 0 0
H. Knight, Dover-road, Northfleet	4,540 0 0
Jonas Hill, The Terrace, Gravesend	4,394 0 0
T. Knight, Sidcup	3,992 0 0
W. & E. Wallis, Pelham-road, Gravesend	3,749 0 0
Balaam Bros., Old Kent-road	3,500 0 0
Russell & Homersham, Swanscombe	3,129 0 0

NORWICH.—For dwelling-house, shop, and workmen's rooms in Queen-street, Norwich, for Messrs. W. Todd & Co. Mr. E. P. Willins, architect, Norwich. Quantities by Messrs. Vinall & Kennedy, Guildford-street, Russell-square :—

Pusey & Lumley, Castle-street, Long Acre	£4,500 0 0
Wilkin & Wilkins, Grapes-hill, Norwich	4,319 0 0
Downing, Victoria-street, Norwich	3,847 0 0
Youngs, Norwich	3,750 0 0
Hawes, Duke-street, Norwich	3,630 0 0
Wegg, St. George's, Norwich	3,524 0 0

PUTNEY.—For shop-fronts at Putney, for Mr. Sawday :—

C. Jeffreys, Hatton-garden (accepted)	£195 0 0

STOKE NEWINGTON.—For alterations to No. 1, Truman's-place, Stoke Newington. Mr. R. A. Lewcock, architect, Bishopsgate-street Within :—

J. Anley	£290 0 0
Jackson & Todd	283 0 0
W. Pringle	167 0 0
S. Goodall	160 0 0

WALTON (Suffolk).—For the erection of Foresters' Hall and two shops, with dwelling-houses under, at Walton, Suffolk. Messrs. Robert T. Orr & Son, architects, Ipswich. Quantities not supplied :—

P. J. S. Cooney, Dovercourt	£2,100 0 0
C. Borrett, Ipswich	1,845 0 0
R. S. Smith, Ipswich	1,599 0 0
C. A. Wyatt, Ipswich	1,538 0 0
D. Thurman, Walton	1,464 8 0
J. B. & F. Bennett, Ipswich	1,400 0 0
A. Coe, Ipswich	1,352 10 0
T. Wawman, Felixstowe	1,295 0 0
Fox & Wallis, Walton	1,250 0 0
T. Ward, Felixstowe	1,125 0 0

SPECIAL NOTICE.—Lists of Tenders frequently reach us too late for insertion. They should be delivered at our office, 46, Catherine-street, W.C., *not later than Four p.m.* on THURSDAYS.

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F. M.—H. G.—G. F. T.—W. F. (the writers of the letters you refer to were not "interested parties").—T. C.—C. G.—W. L. R.—J. H. B. (illegible)—Shops, Harlesden (list received, but without sender's name).

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THE INDEX and TITLE-PAGE for Volume XLIX. (July to December, 1885) was given as a Supplement with our issue of January 9th.

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